



United States
Department of
Agriculture

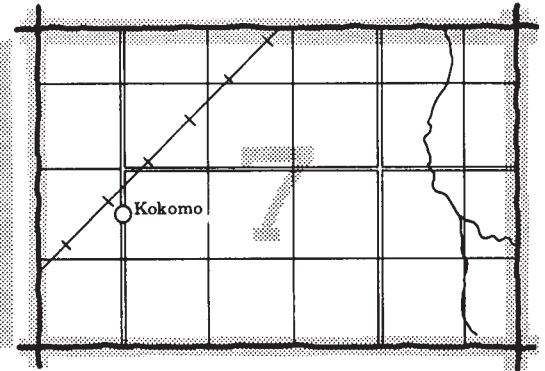
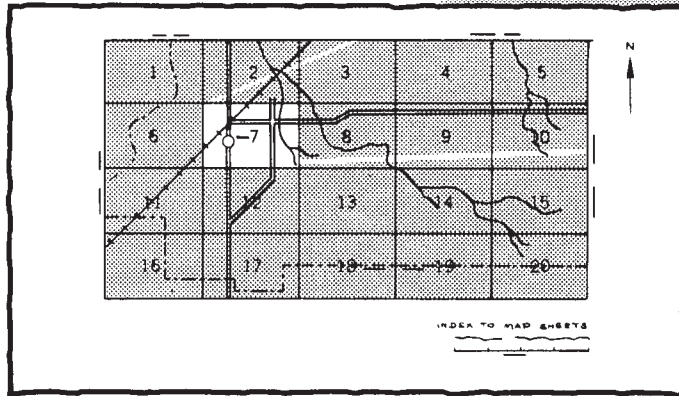
Soil
Conservation
Service

In cooperation with
United States Department
of the Interior,
Bureau of Indian Affairs,
and Montana Agricultural
Experiment Station
Montana State University,
State Land and
Investments Department

Soil Survey of Blaine County and part of Phillips County Montana

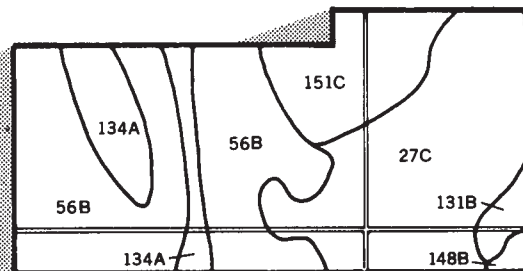
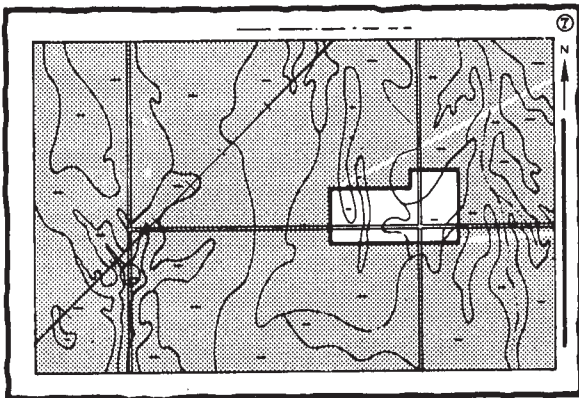
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

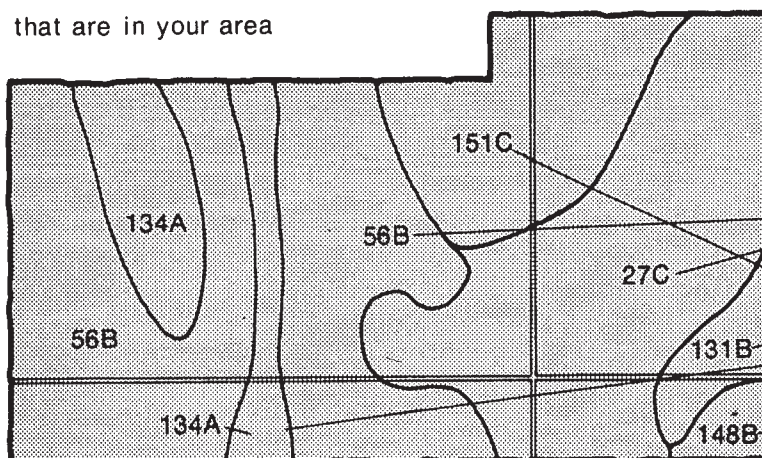


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area



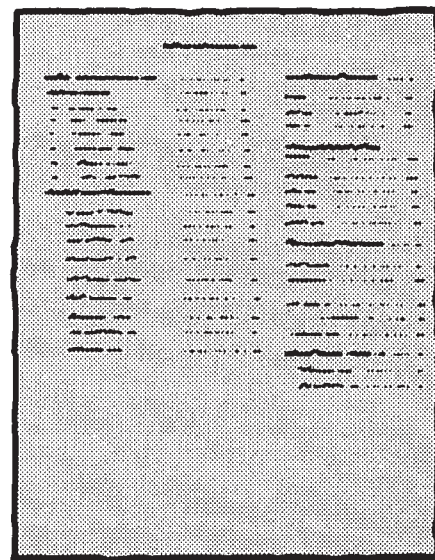
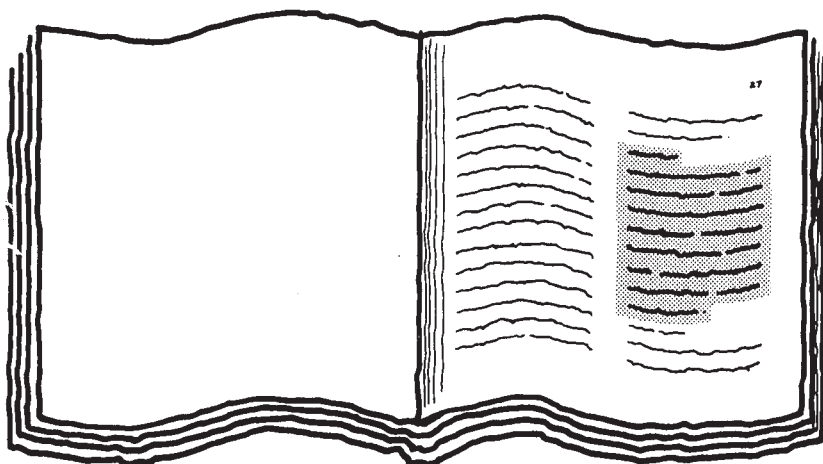
Symbols

27
56
131
134
148
151

THIS SOIL SURVEY

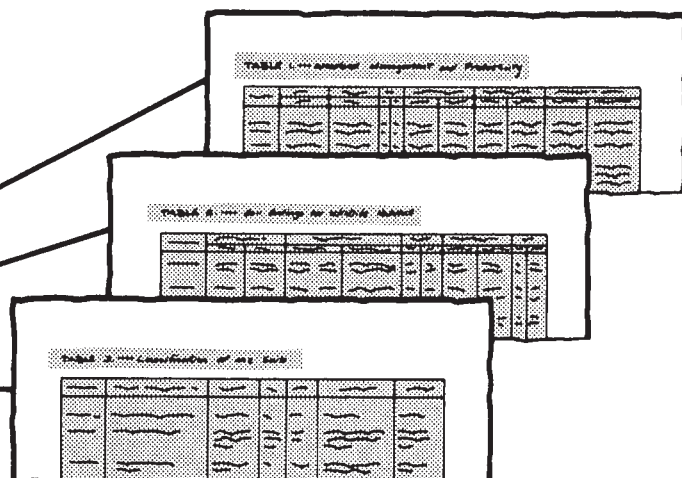
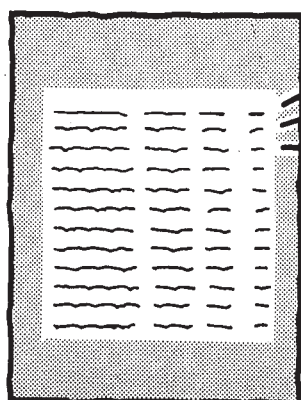
5.

Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6.

See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7.

Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1976. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station, Montana State University, State Land and Investments Department. It is part of the technical assistance furnished to the Blaine County Conservation District and Fort Belknap Tribal Council.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

contents

Index to map units	v	Recreation	117
Summary of tables	vii	Wildlife	118
Foreword	ix	Engineering	119
General nature of the survey area	1	Soil properties	125
How this survey was made	5	Engineering index properties.....	125
General soil map units	7	Physical and chemical properties.....	126
Soil descriptions	7	Soil and water features.....	127
Detailed soil map units	13	Classification of the soils	129
Soil descriptions	13	Soil series and their morphology.....	129
Use and management of the soils	113	Formation of the soils	165
Crops.....	113	Factors of soil formation.....	165
Rangeland	115	References	167
Woodland management and productivity	116	Glossary	169
Woodland understory vegetation.....	117	Tables	177
Windbreaks and environmental plantings.....	117		

soil series

Absher series.....	129	Havre series.....	143
Assinniboine series	130	Havre Variant	143
Attewan series	130	Hedoes series.....	143
Barkof series.....	131	Hillon series	144
Bascovy series.....	131	Joplin series	144
Bearpaw series	132	Judith series.....	145
Beaverell series	133	Kevin series.....	145
Beaverton series	133	Korent series.....	146
Belain series	133	Lardell series.....	146
Benz series	134	Lihen series	146
Bowdoin series	134	Lisam series	147
Cabba series	135	Lolo series	147
Cabbart series.....	135	Macmeal series	148
Castner series.....	136	Marmarth series.....	148
Chinook series.....	136	Martinsdale series	149
Cozberg series.....	136	Marvan series	149
Creed series.....	137	Nesda series	150
Delpoint series.....	137	Nishon series	150
Dilts series.....	138	Nobe series	151
Dimmick series	138	Norbert series	151
Elloam series	139	Perma series.....	151
Ethridge series.....	139	Phillips series	152
Farnut series	140	Reeder series.....	153
Gerdrum series	140	Riedel series	153
Glendive series	141	Savage series	153
Hanly series	142	Scobey series	154
Harlem series.....	142	Shaak series	154
Harlem Variant.....	142	Shawmut series	155

Silverchief series	156	Wabek series	160
Straw series	156	Warneke series.....	160
Telstad series	157	Whitecow series	161
Thoeny series	157	Williams series.....	161
Turner series.....	158	Windham series.....	162
Twilight series	159	Work series	162
Vanda series	159	Yamac series	163
Vida series.....	159	Zahill series.....	163

Issued April 1986

index to map units

1—Absher-Nobe complex, 0 to 4 percent slopes.....	13	40—Elloam clay loam, 0 to 4 percent slopes.....	38
2—Assinniboine fine sandy loam, 0 to 4 percent slopes.....	14	41—Ethridge silty clay loam, 0 to 4 percent slopes ...	39
3—Attewan loam, 0 to 4 percent slopes.....	15	42—Ethridge-Gerdrum complex, 0 to 4 percent slopes.....	40
4—Attewan-Beaverell complex, 0 to 4 percent slopes.....	15	43—Farnuf loam, 0 to 2 percent slopes	40
5—Attewan-Wabek complex, 0 to 4 percent slopes ..	16	44—Farnuf loam, 2 to 4 percent slopes	41
6—Badland.....	17	45—Farnuf loam, 4 to 8 percent slopes	42
7—Barkof clay, 4 to 8 percent slopes	17	46—Gerdrum clay loam, 0 to 4 percent slopes	42
8—Barkof-Norbert clays, 2 to 8 percent slopes.....	18	47—Glendive fine sandy loam.....	43
9—Barkof-Norbert clays, 8 to 20 percent slopes.....	19	48—Hanly loamy fine sand	43
10—Barkof-Windham association, moderately steep.	19	49—Harlem loam	44
11—Bascovy clay, 2 to 6 percent slopes.....	20	50—Harlem silty clay loam	44
12—Bascovy-Lisam-Dilts clays, 2 to 8 percent slopes.....	21	51—Harlem silty clay loam, saline	45
13—Bearpaw clay loam, 0 to 4 percent slopes	21	52—Harlem silty clay	45
14—Bearpaw-Elloam clay loams, 0 to 4 percent slopes.....	22	53—Harlem silty clay, saline	46
15—Bearpaw-Elloam clay loams, 4 to 8 percent slopes.....	23	54—Harlem Variant-Lardell silty clay loams	46
16—Bearpaw-Vida clay loams, 0 to 4 percent slopes	24	55—Havre loam.....	47
17—Bearpaw-Vida clay loams, 4 to 8 percent slopes	24	56—Havre loam, saline	47
18—Belain loam, 2 to 8 percent slopes.....	25	57—Havre silty clay loam.....	48
19—Benz loam, 0 to 4 percent slopes.....	26	58—Havre silty clay loam, saline	49
20—Bowdoin clay.....	26	59—Havre, Hanly and Glendive soils, channeled	49
21—Cabba loam, 8 to 35 percent slopes	27	60—Havre Variant-Lardell silty clay loams	50
22—Cabba-Rock outcrop complex, 25 to 75 percent slopes.....	27	61—Hedoes loam, 2 to 4 percent slopes	51
23—Cabba-Windham association, steep	28	62—Hedoes loam, 4 to 8 percent slopes	51
24—Cabba-Zahill association, steep	28	63—Hedoes-Belain loams, 4 to 15 percent slopes	52
25—Cabbart-Delpoint loams, 8 to 35 percent slopes	29	64—Hedoes-Belain loams, 15 to 35 percent slopes ..	53
26—Cabbart-Hillon association, steep.....	30	65—Hedoes-Belain-Castner complex, 15 to 60 percent slopes	53
27—Cabbart-Rock outcrop, shale complex, 25 to 60 percent slopes	30	66—Hedoes-Benz loams, 2 to 4 percent slopes	55
28—Cabbart-Yamac-Rock outcrop complex, 15 to 70 percent slopes.....	31	67—Hillon clay loam, 25 to 45 percent slopes	56
29—Castner gravelly loam, 8 to 35 percent slopes....	32	68—Hillon-Kevin clay loams, 15 to 35 percent slopes.....	56
30—Castner-Perma-Rock outcrop complex, 25 to 70 percent slopes	32	69—Hillon-Scobey clay loams, 4 to 20 percent slopes.....	56
31—Chinook fine sandy loam, 2 to 6 percent slopes	33	70—Judith-Windham complex, 4 to 8 percent slopes	57
32—Chinook fine sandy loam, 6 to 12 percent slopes.....	33	71—Judith-Windham complex, 8 to 15 percent slopes.....	58
33—Chinook-Phillips complex, 2 to 6 percent slopes	34	72—Kevin clay loam, 2 to 8 percent slopes.....	59
34—Cozberg fine sandy loam, 0 to 4 percent slopes	34	73—Kevin-Elloam clay loams, 2 to 8 percent slopes.	59
35—Creed loam, 0 to 4 percent slopes	35	74—Kevin-Hillon clay loams, 8 to 15 percent slopes.	60
36—Creed-Gerdrum complex, 0 to 4 percent slopes.	36	75—Korent-Nesda complex, occasionally flooded	61
37—Delpoint loam, 2 to 4 percent slopes	36	76—Lardell silty clay loam	61
38—Delpoint-Cabbart loams, 2 to 8 percent slopes...	37	77—Lihen loamy fine sand, 0 to 6 percent slopes	62
39—Dimmick clay.....	38	78—Lihen loamy fine sand, 6 to 12 percent slopes ...	62
		79—Lisam-Dilts clays, 8 to 35 percent slopes	63
		80—Lisam-Dilts-Rock outcrop, shale complex, 25 to 60 percent slopes.....	63
		81—Lisam-Hillon association, steep	65
		82—Lisam-Wabek association, steep.....	65

83—Lolo loam	66	118—Straw and Nesda soils, channeled	90
84—Macmeal association, steep	67	119—Telstad loam, 0 to 4 percent slopes	91
85—Marmarth-Cabbart complex, 2 to 8 percent slopes	68	120—Telstad-Joplin loams, 0 to 4 percent slopes	91
86—Martinsdale clay loam, 0 to 4 percent slopes	68	121—Telstad-Joplin loams, 4 to 8 percent slopes	92
87—Martinsdale-Judith complex, 2 to 8 percent slopes	69	122—Telstad-Joplin gravelly loams, 0 to 4 percent slopes	93
88—Marvan clay, 0 to 4 percent slopes	70	123—Thoeny-Elloam complex, 0 to 4 percent slopes	93
89—Marvan-Bascovy clays, 2 to 8 percent slopes	71	124—Thoeny-Kevin-Elloam complex, 4 to 8 percent slopes	94
90—Nishon loam	72	125—Turner loam, 0 to 4 percent slopes	95
91—Nishon clay loam	72	126—Turner-Beaverton complex, 2 to 8 percent slopes	96
92—Norbert clay, 8 to 35 percent slopes	72	127—Twilight-Riedel fine sandy loams, 4 to 8 percent slopes	97
93—Norbert-Rock outcrop, shale complex, 25 to 60 percent slopes	73	128—Twilight-Riedel fine sandy loams, 8 to 20 percent slopes	98
94—Perma-Castner-Belain complex, 25 to 60 percent slopes	73	129—Typic Fluvaquents, 0 to 2 percent slopes	98
95—Phillips loam, 0 to 4 percent slopes	74	130—Typic Ustifluvents, wet	99
96—Phillips loam, 4 to 8 percent slopes	75	131—Ustic Torrifluvents, wet	99
97—Phillips-Elloam complex, 0 to 4 percent slopes ..	76	132—Vanda clay, 0 to 2 percent slopes	99
98—Phillips-Elloam complex, 4 to 8 percent slopes ..	77	133—Vanda-Nobe clays, 0 to 2 percent slopes	100
99—Phillips-Kevin complex, 0 to 4 percent slopes	78	134—Vanda-Nobe clays, 2 to 8 percent slopes	100
100—Phillips-Kevin complex, 4 to 8 percent slopes ..	79	135—Vida clay loam, 4 to 8 percent slopes	101
101—Pits, gravel	79	136—Vida-Zahill clay loams, 8 to 15 percent slopes ..	102
102—Reeder loam, 2 to 4 percent slopes	80	137—Wabek gravelly loam, 8 to 35 percent slopes ..	102
103—Reeder loam, 4 to 8 percent slopes	80	138—Warneke-Whitecow-Rock outcrop complex, 35 to 70 percent slopes	103
104—Rubble land-Rock outcrop association	81	139—Whitecow-Warneke gravelly loams, 25 to 60 percent slopes	104
105—Savage silty clay loam, 0 to 2 percent slopes ..	81	140—Whitecow association, steep	105
106—Savage silty clay loam, 2 to 4 percent slopes ..	82	141—Williams loam, 0 to 4 percent slopes	106
107—Savage-Gerdum silty clay loams, 0 to 4 percent slopes	82	142—Williams-Vida loams, 0 to 4 percent slopes	106
108—Scobey clay loam, 0 to 4 percent slopes	83	143—Williams-Vida loams, 4 to 8 percent slopes	107
109—Scobey-Kevin clay loams, 0 to 4 percent slopes	84	144—Windham cobbly loam, 15 to 45 percent slopes	108
110—Scobey-Kevin clay loams, 4 to 8 percent slopes	84	145—Work clay loam, 0 to 4 percent slopes	108
111—Shaak loam, 0 to 4 percent slopes	85	146—Work clay loam, 4 to 8 percent slopes	109
112—Shaak-Gerdum complex, 0 to 4 percent slopes	86	147—Yamac loam, 2 to 4 percent slopes	109
113—Shawmut gravelly loam, 0 to 4 percent slopes ..	87	148—Yamac-Benz loams, 0 to 4 percent slopes	110
114—Shawmut gravelly loam, 4 to 8 percent slopes ..	87	149—Yamac-Wabek association, moderately steep ..	110
115—Silverchief-Whitecow-Macmeal association, steep	88	150—Zahill clay loam, 25 to 45 percent slopes	111
116—Straw-Korent loams	89	151—Zahill-Vida clay loams, 15 to 35 percent slopes	111
117—Straw-Korent loams, occasionally flooded	90		

summary of tables

Temperature and precipitation (table 1).....	178
Freeze dates in spring and fall (table 2)	179
<i>Probability. Temperature.</i>	
Growing season (table 3).....	180
Acreage and proportionate extent of the soils (table 4)	181
<i>Acres. Percent.</i>	
Yields per acre of crops (table 5)	184
<i>Winter wheat. Spring wheat. Barley. Oats. Alfalfa hay.</i>	
<i>Sugar beets. Corn silage.</i>	
Recreational development (table 6).....	189
<i>Camp areas. Picnic areas. Playgrounds. Paths and trails.</i>	
Building site development (table 7)	203
<i>Shallow excavations. Dwellings without basements.</i>	
<i>Dwellings with basements. Small commercial buildings.</i>	
<i>Local roads and streets.</i>	
Sanitary facilities (table 8).....	218
<i>Septic tank absorption fields. Sewage lagoon areas.</i>	
<i>Trench sanitary landfill. Area sanitary landfill. Daily cover</i>	
<i>for landfill.</i>	
Construction materials (table 9)	232
<i>Roadfill. Sand. Gravel. Topsoil.</i>	
Water management (table 10).....	246
<i>Pond reservoir areas. Embankments, dikes, and levees.</i>	
<i>Drainage. Irrigation. Terraces and diversions. Grassed</i>	
<i>waterways.</i>	
Engineering index properties (table 11)	260
<i>Depth. USDA texture. Classification—Unified, AASHTO.</i>	
<i>Fragments greater than 3 inches. Percentage passing</i>	
<i>sieve—4, 10, 40, 200. Liquid limit. Plasticity index.</i>	
Physical and chemical properties of the soils (table 12)	282
<i>Depth. Permeability. Available water capacity. Reaction.</i>	
<i>Salinity. Shrink-swell potential. Erosion factors. Wind</i>	
<i>erodibility group.</i>	
Soil and water features (table 13).....	296
<i>Hydrologic group. Flooding. High water table. Bedrock.</i>	
<i>Potential frost action.</i>	
Classification of the soils (table 14).....	304
<i>Family or higher taxonomic class.</i>	

foreword

This soil survey contains information that can be used in land-planning programs in the survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

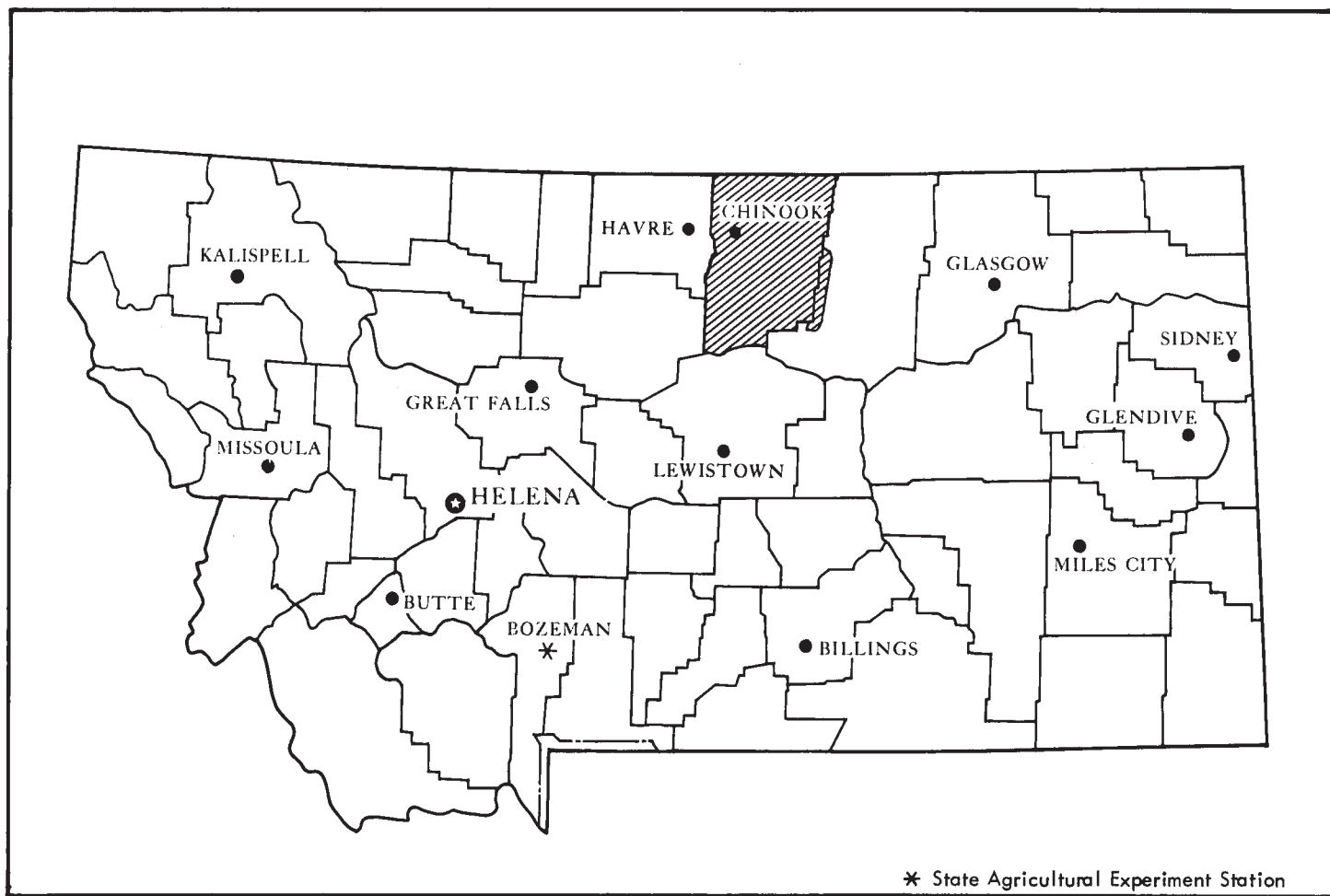
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Van K. Haderlie
State Conservationist
Soil Conservation Service



Location of Blaine County and part of Phillips County in Montana.

soil survey of Blaine County and part of Phillips County, Montana

By George B. Hilts, Soil Conservation Service

Fieldwork by Arial Anderson, Huey A. Long, Robert E. Richardson,
and LaMonte C. Bingham, Soil Conservation Service, and
Thomas Quillen, Stanley B. Cline, and Donald E. McClure,
Bureau of Indian Affairs

United States Department of Agriculture, Soil Conservation Service,
and United States Department of the Interior, Bureau of Indian Affairs,
in cooperation with the Montana Agricultural Experiment Station
Montana State University, State Land and Investments Department

BLAINE COUNTY AND PART OF PHILLIPS COUNTY make up the survey area. The area is in the extreme north-central part of Montana. It is bounded on the north by the Province of Saskatchewan, Canada, on the west by Hill and Chouteau Counties, on the south by the Missouri River and Phillips County, and on the east by Phillips County. The area is made up of all of Blaine County, 2,730,880 acres, and part of Phillips County, 115,448 acres. The area covers about 4,447 square miles.

In the survey area, about 633,408 acres of land are owned by Indians, 536,085 acres are federally owned, 178,555 acres are state owned, and 1,498,280 acres are privately owned. The Fort Belknap Indian Reservation makes up most of the Indian owned land; Indian Trust land makes up a small acreage. The Indian lands are administered by the Fort Belknap Tribal Council and the Bureau of Indian Affairs.

general nature of the survey area

This section includes information about the history and population of the survey area, natural resources, climate, agriculture, and physiography.

history and population

The early inhabitants of the area were the Blackfeet and Gros Ventres Indians. Later, the Assiniboiné Indians migrated into the area. Fur traders started coming into the area soon after the Lewis and Clark Expedition of 1804-06. The first successful trading post was Fort Belknap, which was established in the early 1870's on the Milk River near the present site of Chinook.

The original Fort Belknap Indian Reservation was established in 1873. It included a large area north of the Missouri River in northern Montana. Amendments to the Indian Reservation Act have reduced the reservation to its present size.

The gold rush days in western Montana brought many settlers into the survey area. Boats brought people and cargo up the Missouri River to Fort Benton in the late 1870's through the 1880's. During periods of low water, steamboats frequently were unloaded on Cow Island at a point where Cow Creek empties into the Missouri River. The Cow Island Trail was used to transport people and cargo overland to points further west.

The Milk River Valley was settled after the completion of the Northern Pacific Railroad in 1887. Cattle ranching expanded during the 1880's and 1890's, and raising cattle, sheep, and horses remained the major land use until 1908 when large tracts of public land were opened for settlement. Homesteading continued until 1917. Because of a drought from 1917 to 1919, some of the homesteaded land was abandoned. Many ranchers suffered severe livestock losses in the blizzard of 1919.

Farm and ranch populations declined further in the 1920's and 1930's. The drought and depression in the 1930's resulted in more land being abandoned or taken over by lending agencies and mortgage companies. Some of this land was purchased by neighboring farmers and ranchers, but thousands of acres went to county, state, and federal ownership. Most of the land held by lending agencies and by the county were taken over by private ownership or by the federal government.

Blaine County was established from a part of Chouteau County on March 2, 1912. At that time Blaine County included the western one-third of what is now Phillips County. Phillips County was established in 1915, and since then the boundaries of Blaine County have not changed.

The population of Blaine County in 1970 was 6,727, according to the U.S. Census, and that of Chinook, the county seat of Blaine County, was 1,813. Chinook is in the west-central part of the county in the Milk River Valley. Other centers of population are Harlem, Hays, Hogeland, Turner, Zurich, and Fort Belknap Agency.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Blaine and Phillips Counties are usually quite warm in summer. There are frequent spells of hot weather and occasional cool days. Winters are very cold because of the Arctic air masses that frequently move into the area. Most of the precipitation falls during the warm period and normally it is heaviest late in spring and early in summer. Snowfall normally is not heavy. The snow is blown into drifts so that much of the ground is free of snow.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Chinook and Cleveland in the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter at Chinook, Montana, the average temperature is 17 degrees F, and the daily minimum temperature is 6 degrees. The lowest temperature on record, -50 degrees, occurred at Chinook on January 20, 1954. In summer the average temperature is 67 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, 109 degrees, occurred on August 5, 1961.

In winter at Cleveland, Montana, the average temperature is 20 degrees F, and the average daily minimum temperature is 8 degrees. The lowest temperature on record, -41 degrees, occurred at Cleveland on January 24, 1969. In summer the average temperature is 65 degrees, and the average daily maximum temperature is 79 degrees. The highest recorded temperature, 107 degrees, occurred on August 5, 1961.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing

degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation at Chinook, 9 inches, or 75 percent, generally falls from April through September, the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 7 inches. The heaviest 1-day rainfall during the period of record was 2.95 inches at Chinook on June 17, 1965.

Of the total annual precipitation at Cleveland, 12 inches, or 80 percent, usually falls from April through September, the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 9 inches. The heaviest 1-day rainfall during the period of record was 2.57 inches at Cleveland on June 13, 1970.

Thunderstorms in the survey area occur on about 22 days each year, and most occur in summer.

Average seasonal snowfall is 29 inches at Chinook and 55 inches at Cleveland. The greatest snow depth at any one time during the period of record was 29 inches at Chinook and 18 inches at Cleveland. On an average of 19 days, at least 1 inch of snow is on the ground at Chinook and at Cleveland, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 45 percent. Humidity is higher at night, and the average at dawn is about 70 percent. The sun shines 80 percent of the time possible in summer and 51 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 11 miles per hour, in April.

Blizzards occur several times each winter in the survey area. Hail falls during summer thunderstorms in small scattered areas.

markets and transportation

Chinook and Harlem are the major shopping centers and markets within the area. Smaller towns or places such as Hays, Lodgepole, Turner, Cleveland, Lohman, Lloyd, Hodgeland, Zurich, and Fort Belknap Agency have limited services. Most of the grain produced in the area is transported by truck or rail to west coast markets. The livestock, mainly calves or yearlings, is shipped to feedlots in other areas.

The major roads in the survey area are U.S. Highway 2, which nearly parallels the railroad in an east-west direction; State Highway 376, extending from U.S. Highway 2 southeast of Harlem, southward across the Fort Belknap Reservation; and State Highway 241, which extends northeast from Harlem to Canada. A county network of gravel roads is extensive in the dry-farmed areas. There are only a few access roads in ranching areas. A bus line serves the area east and west on U.S. Highway 2.

Small airports with asphalt surfaced runways are located in the towns of Chinook and Harlem.

agriculture

Farms and ranches provide the economic base in the survey area. Agricultural income in most years is fairly well balanced between the production of livestock and cultivated crops.

About 79 percent, or 2,256,000 acres, of the area is rangeland and grazable woodland. The major income-producing livestock are cattle (cow-calf units), hogs, and sheep. Most livestock is shipped out of the area for finishing or processing.

About 19 percent of the area, or 550,000 acres, is used for cultivated crops, both irrigated (80,000 acres) and dryland (470,000 acres). The major dryland crops are wheat, barley, and hay. Wheat and barley are grown in a crop-fallow rotation. The major irrigated crops are wheat, barley, hay, and corn for silage.

The remaining 2 percent of the survey area, about 40,000 acres, is divided between commercial woodland, 18,000 acres, and nonagricultural land, 22,000 acres.

The major area of irrigated land is in the Milk River Valley and along the principal tributaries of the Milk River. The largest areas of dry cropland are on the "Big Flat" in the northeastern part of the survey area and on the rolling glaciated plains that lie south of the Milk River Valley. Most of the potential commercial woodland is in the Little Rocky Mountains; some small areas are in the Bearpaw Mountains.

A part of the Milk River Valley was organized into the Paradise Conservation District in 1944. Other areas in Blaine County were added to this district in 1957. In 1961 the district was reorganized into the Blaine County Soil Conservation District. It included all of the county except the part in the Fort Belknap Indian Reservation.

irrigated land

That part of the Milk River Valley that is within the survey area is the largest area under irrigation. It is served by five major gravity systems that divert water from the Milk River. Off-season water is stored in the Fresno Reservoir on the Milk River, about 12 miles west-northwest of Havre in Hill County. Additional water is diverted through a canal on the Swift Current Creek, a tributary of the St. Mary River, to the upper part of the Milk River. The water supply is sufficient in most years, but excessive use of water for irrigation, lack of good drainage, and canal losses have caused some areas to become seeped and saline.

Small but important areas along Battle, Lodge, Clear, Cow, Snake, Bean, Peoples, and Little Peoples Creeks are irrigated to produce hay and grain crops. Although these creeks are classified as perennial streams, the water supply is limited or is not available during part of the summer.

Storage dams or wells supply water to some sprinkler irrigation systems on uplands, and a large aquifer, which is recharged only from precipitation, supplies irrigation water to the "Big Flat" area.

ground water

The quality and quantity of ground water in the survey area depends largely on bedrock formations, which are exposed or underlie the superficial glacial and stream deposits. The glacial till on the glaciated plains, which varies from a few feet to about 200 feet in thickness, is generally not a dependable source of good quality ground water.

The dark colored shale of the Bearpaw Formation, which underlies a large part of the northern glaciated plains, is not a dependable source of highly mineralized water. Bearpaw shale also underlies the glaciated plains in a part of the Fort Belknap Reservation and is exposed in higher areas on the uplands in the southern part of the survey area.

Some sections of the soft shale and sandstone of the Judith River Formation, which underlies the Bearpaw Formation, produce moderate amounts of water that is generally suitable for domestic and livestock use. This formation underlies most of the southern glaciated plains west of the Fort Belknap Reservation. It also underlies extrusive igneous and colluvial deposits on slopes of the Bearpaw Mountains and Little Rocky Mountains, and it is exposed or underlies the Bearpaw formation in the southern part of the survey area.

Wells in the Milk Valley yield a small to moderate amount of highly mineralized water, except for shallow wells in sandy alluvium near the Milk River. Deep wells drilled several hundred feet through the alluvium into the Judith River Formation produce enough water for livestock use. This water is generally of poor quality, so water for household use is generally hauled from the towns of Chinook or Harlem.

Valleys of the larger tributaries of the Milk River and the Missouri River generally have gravelly alluvium that produces enough good water for domestic and livestock uses.

The "Big Flat" area has plenty of good quality ground water for domestic and livestock use and enough for limited irrigation use. The glaciated part of the "Big Flat" area at a depth of less than 50 feet is underlain by Flaxville gravel, which is a good aquifer. In some valleys Flaxville gravel is exposed, or the valleys are filled with gravelly alluvium. Fox Hills sandstone underlying the gravel is also considered a good ground water aquifer in this area.

Igneous bedrock in the Bearpaw Mountains is not generally a source of ground water. Wells, in valleys and basins, drilled through extrusive igneous rock into Judith River and Eagle Sandstone Formations produce enough water for domestic and livestock use. Numerous springs produce good water from bedrock in the valleys and on the sides of the mountains.

The main source of ground water in the Little Rocky Mountains is the gravel-filled alluvium in narrow valleys. Some springs occur on the sides of mountains.

Other sources of water include an artesian aquifer between Bean Creek and Snake Creek, but little information is available on this aquifer. Several wells about 3,000 feet deep to Madison limestone supply water to the Bowes oilfield, about 5 miles south of Chinook. Good water from shallow wells can be obtained locally from outwash deposits on the glaciated plains.

natural resources

In addition to the soil, other important natural resources within the survey area are petroleum, natural gas, lignite coal, bentonite clay, timber, and gravel. The full extent of these resources is not generally known, or the resources have not been developed.

The Bowes oilfield, about 5 miles south of Chinook, on part of the Bearpaw Arch which surrounds the Bearpaw Mountains, has been in production since 1950. It produces asphalt-base crude from an area of about 2 square miles. Another small oilfield, about 5 miles northeast of Chinook, has been in production since 1973. The petroleum is shipped out of the survey area for refining.

Natural gas was discovered in the Bearpaw Arch in 1926 during development of the Bowes oilfield. Low gas prices deterred development until 1966 when the Tiger Ridge gasfield began operations. A compressor station and a pipeline to transport most of the gas out of the area were completed in 1972. Natural gas from the Bowes field and some gas from the Tiger Ridge field is used locally.

Discontinuous lignite coalbeds occur in the shale strata that underlie most of the area. Some lignite coalbeds that are commercially suitable for stripmining occur in areas north and south of the Milk River Valley in the Western part of Blaine County. Some core drilling has been done to establish location, extent, and thickness of these coal seams.

Bentonite clay deposits, which outcrop along Thirty-Mile Coulee northwest of Harlem, have been explored, and mining claims have been filed on most of the exposed beds.

In some parts of the area, deposits of gravel and sand are extensive. These deposits generally are associated with glacial outwash and old terraces. Locally, they provide gravel and sand for road construction and for making concrete.

There are more than 80,000 acres of woodland where the canopy cover of trees is more than 15 percent, but only about 18,000 acres in the survey area are considered potentially suitable for commercial timber production. The potential areas are mostly on north and east slopes in the Little Rocky Mountains and on some north slopes in the west-central part of the Bearpaw

Mountains. Noncommercial stands of ponderosa pine cover some of the shale and sandstone uplands in the southern part of the survey area. There are such stands also in the Bearpaw Mountains and in parts of the Little Rocky Mountains. Small areas adjacent to the Milk River and its principal tributaries have noncommercial stands of cottonwood trees.

Gold and silver have been mined in the survey area, but mining operations ceased in the late 1950's because the low volume of ore made mining in this area unprofitable.

physiography and drainage

The survey area varies widely in parent material and in landforms. Six major landforms make up most of the area. These are (1) the glaciated plains, (2) Bearpaw Mountains, (3) Milk River Valley, (4) shale and sandstone uplands, (5) a large glacial outwash plain in the northeastern part of the area known locally as the "Big Flat", and (6) the Little Rocky Mountains.

The glaciated plains make up the northern two-thirds of the survey area except for the "Big Flat" and the Milk River Valley. These plains formed during several periods of late Wisconsin glaciation. The landscape ranges from nearly level to gently rolling in some areas and from strongly rolling to steep in other areas. The glacial till ranges in thickness from a few feet to about 200 feet; it generally is underlain by loamy and clayey shale. Major drainage systems are deeply entrenched, and they drain into the Milk River. The elevation ranges from about 2,300 to 3,800 feet. The climate is semiarid continental; precipitation ranges from 10 to 17 inches annually.

The Bearpaw Mountains make up an area in the southwestern part of the survey area between the glaciated plains and the shale and sandstone uplands. Large dikes and sills radiate from the peaks and ridges, and extrusive igneous rock covers the slopes and basins that are generally underlain by sedimentary bedrock. Drainage systems are well established but generally are not deeply entrenched. The elevation ranges from about 3,300 to 6,000 feet. Precipitation ranges from 14 to 19 inches annually. The northwestern part receives the most moisture.

The Milk River Valley extends east-west through the north-central part of the survey area. On the average, it is about 4 miles wide, except for a small area on the western boundary of Blaine County where it is only about 1 mile wide. It is part of the preglacial channel of the Missouri River. The land is used mostly for irrigated crops. The elevation ranges from 2,300 to 2,500 feet. Precipitation ranges from 10 to 14 inches annually.

The shale and sandstone uplands make up a large area in the southwestern part of the survey area. These uplands extend north of the Missouri River to the Bearpaw Mountains and Little Rocky Mountains. The

landscape ranges from broad rolling ridges to steep or very steep broken areas. Residual bedrock is mainly clayey shale of the Bearpaw Formation overlying soft shale and sandstone of the Judith River and Claggett Formations. Extensive faulting occurred during the uplift of the mountains. Steep, severely eroded bluffs and drainageways border the Missouri River. The elevation ranges from about 2,300 to 4,000 feet. Precipitation ranges from 10 to 14 inches annually.

The "Big Flat" area is in the northeastern part of Blaine County. Although this area was glaciated, it differs from the normal glaciated plains in that it is on a low plateau that escaped severe glacial scouring. It formed mainly from water-sorted glacial till and has smoother relief than is typical of glaciated plains. Flaxville gravel underlies the "Big Flat" area at a depth of about 30 to 100 feet except in small valleys. The small valleys are either filled with loose gravel and sand or beds of Flaxville gravel. Drainage systems are weakly defined except for the deeply entrenched Woody Island Coulee and its tributaries. The elevation ranges from 3,000 to 3,400 feet. The climate is semiarid continental. Precipitation ranges from 10 to 14 inches annually.

The Little Rocky Mountains occupy a small area in the extreme southeastern part of the survey area. These mountains are mainly igneous uplift through beds of Madison limestone. The relief is mostly rugged, and the north- and east-facing slopes are generally forested. The elevation ranges from about 4,000 to 6,000 feet. Drainage systems are well established and are deeply entrenched in some areas of limestone bedrock. Precipitation ranges from 17 to 25 inches annually.

All of the survey area is drained by two major drainage systems, the Milk River and the Missouri River. The Milk River drains approximately the northern two-thirds of the area, although some of the tributaries flow into the river outside the area. The principal tributaries of the Milk River are Lodge, Battle, Thirty Mile, Woody Island, Wayne, and Savoy Creeks from the north and Clear, Bean, Snake, White Bear, and Peoples Creeks from the south. The principal tributaries of the Missouri River in the survey area are Black, Bullwhacker, and Cow Creeks. Most of the creeks south of the Milk River Valley have their headwaters in the Bearpaw Mountains and Little Rocky Mountains.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

The soils in this survey area have been grouped into six general kinds of landscapes for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the paragraphs that follow. The terms for texture in the legend that follows the name of the map unit apply to the texture of the surface layer.

nearly level, deep, well drained to somewhat poorly drained soils on flood plains and stream terraces

The soils in this general group are on flood plains and stream terraces in valleys. The average annual precipitation ranges from 10 to 14 inches, and the frost-free season is 105 to 125 days. The soils are used mainly for irrigated crops. In some areas they are used for dryland crops and range. Areas of range have sparse to dense stands of brush and cottonwood trees. Irrigated crops are wheat, barley, alfalfa hay, sugar beets, and corn for silage. Dryland crops are mainly wheat and barley.

1. Harlem-Havre-Lardell

Nearly level, deep, well drained to somewhat poorly drained, nonsalt-affected to very strongly salt-affected, nonsodium-affected to very strongly sodium-affected silty clay loams and loams

The soils in this map unit are on the flood plains and stream terraces of the Milk River Valley and its major tributaries. Slopes are 0 to 2 percent.

This unit makes up about 5 percent of the survey area. It consists of about 30 percent Harlem soils, 30 percent Havre soils, 15 percent Lardell and similar soils, and 25 percent minor soils, including Bowdoin, Glendive, Hanley, Harlem Variant, Havre Variant, and Nobe soils.

The Harlem soils have a surface layer of silty clay loam. The underlying material is silty clay loam stratified with thin lenses of clay loam, silty clay, and other material. These soils range from nonsalt-affected to moderately salt-affected and from nonsodium-affected to moderately sodium-affected.

The Havre soils have a loam surface layer. The underlying material is loam stratified with thin lenses of fine sandy loam to clay loam. Havre soils range from nonsalt-affected to moderately salt-affected and from nonsodium-affected to moderately sodium-affected.

The Lardell soils have a surface layer of silty clay loam. The underlying material is silty clay loam and loam stratified with thin lenses of fine sandy loam to silty clay loam. Lardell soils are very strongly salt-affected and very strongly sodium-affected.

The soils that are nonaffected to moderately affected by salt and sodium are used mainly for irrigated crops and for range. The crops are alfalfa hay, corn for silage, wheat, and barley. The soils that are strongly or very strongly salt-affected and sodium-affected are used mainly for range.

The soils in this unit have good potential for the development of habitat for wildlife, including white-tailed deer and other mammals and pheasants, ducks, and nongame birds. The streams have good potential for catfish, bass, trout, and pike.

nearly level to steep, deep and shallow, well drained soils on northern glaciated plains

The soils of the northern glaciated plains formed in glacial till. The average annual precipitation ranges from 10 to 14 inches, and the frost-free season is 100 to 125 days. The soils are used mainly for dry-farmed crops and range. In a few small areas they are used for irrigated crops. The native vegetation is mainly mid and short grasses.

There are four map units in this group.

2. Kevin-Scobey-Hillon

Nearly level to steep, deep, well drained clay loams

This map unit is on the glaciated plains in the northeastern part of the survey area. Slopes range from 0 to 45 percent.

This unit makes up about 9 percent of the survey area. It consists of about 30 percent Kevin soils, 20 percent Scobey soils, 20 percent Hillon soils, and 30 percent minor soils, including Assinniboine, Chinook, Dimmick, Elloam, Joplin, Nishon, Phillips, and Telstad soils.

Kevin soils are nearly level to hilly. They are clay loam throughout.

Scobey soils are nearly level to gently rolling. They are clay loam throughout.

Hillon soils are strongly rolling to steep. They are clay loam throughout.

The soils in this unit are used mainly for dryland crops and for range. Wheat and barley are the principal crops. The native vegetation is mainly mid and short grasses.

The soils in this unit have good potential for habitat for wildlife, including pronghorn antelope, mule deer, and other mammals, pheasants, sharp-tailed grouse, gray (or Hungarian) partridge, and nongame birds.

3. Telstad-Joplin

Nearly level to gently rolling, deep, well drained loams

The soils in this map unit are on the glaciated plains in the northeastern and the central parts of the survey area. Slopes range from 0 to 8 percent.

This unit makes up about 9 percent of the survey area. It consists of about 70 percent Telstad soils, 10 percent Joplin soils, and about 20 percent minor soils, including Assinniboine, Attewan, Beaverell, Chinook, Hillon, Nishon, and Wabek soils.

The Telstad soils are nearly level to gently rolling. They have a loam surface layer, a clay loam subsoil, and a clay loam substratum.

The Joplin soils are nearly level to gently rolling. They have a loam surface layer, a clay loam and loam subsoil, and a loam substratum.

The soils in this unit are used mainly for dryland crops, but in some areas they are used for range. The native vegetation is mainly short and mid grasses.

These soils have good potential for habitat for pronghorn antelope and other mammals and nongame birds.

4. Phillips-Elloam-Thoeny

Nearly level to gently rolling, deep, well drained, nonsodium-affected and slightly sodium-affected loams and moderately sodium-affected clay loams

This map unit is on the glaciated plains in the northern and the east-central parts of the survey area. Slopes range from 0 to 8 percent.

This unit makes up about 24 percent of the survey area. It consists of about 35 percent Phillips soils, 20

percent Elloam soils, 10 percent Thoeny soils, and 35 percent minor soils, including Assinniboine, Chinook, Kevin, Nobe, Scobey, and Telstad soils.

Phillips soils are nearly level to gently rolling. They have a loam surface layer, a clay and clay loam subsoil, and a clay loam substratum.

Elloam soils are nearly level to gently rolling. They have a clay loam surface layer, a clay loam subsoil, and a clay loam substratum. They are moderately sodium-affected.

Thoeny soils are nearly level to gently rolling. They have a loam surface layer, a clay and clay loam subsoil, and a clay loam substratum. They are slightly sodium-affected.

The soils in this unit are used for range and for dryland crops. Wheat, barley, and oats are the main dryland crops. The native vegetation is short and mid grasses.

The soils have good potential for the development of habitat for pronghorn antelope, mule deer, and other mammals and sage grouse, sharp-tailed grouse, and nongame birds.

5. Hillon-Lisam-Cabbart

Moderately steep and steep, deep and shallow, well drained loams, clay loams, and clays

The soils in this map unit are in the northern half of the survey area, mainly along the Milk River Valley. They are in areas where the glacial till has been partly or entirely eroded away and soft shale has been exposed. Slopes range from 15 to 45 percent.

This unit makes up about 4 percent of the survey area. It consists of about 45 percent Hillon soils, 20 percent Lisam soils, 15 percent Cabbart soils, and 20 percent minor soils, including Bascovy, Dilts, Kevin, Marvan, Vanda, and Yamac soils. Areas of shale outcrop are included.

Hillon soils are hilly and steep. They formed in glacial till. They are clay loam throughout.

Lisam soils are steep. They formed in thin bedded shale. They have a clay surface layer, clay underlying material, and shale bedrock below a depth of 17 inches.

Cabbart soils are steep. They formed in siltstone. They have a loam surface layer, loam underlying material, and soft siltstone bedrock below a depth of 12 inches.

The soils in this map unit are used mainly for range. The native vegetation is mainly short and mid grasses.

The soils have good potential for use as habitat for wildlife, including pronghorn antelope, mule deer, and other mammals and sage grouse, sharp-tailed grouse, and nongame birds.

nearly level to steep, deep, well drained soils on southern glaciated plains

The soils of the southern glaciated plains formed in glacial till. This is the southernmost extent of the glaciation in the survey area. The average annual

precipitation ranges from 13 to 17 inches, and the frost-free season is 100 to 125 days. The soils are used mainly for dry-farmed crops and range. In some areas they are used for irrigated crops. The native vegetation is mainly mid grasses.

There are two map units in this group.

6. Vida-Bearpaw-Zahill

Nearly level to steep, deep, well drained clay loams

This map unit is on the rolling glaciated plains in a wide band that extends from the west-central part to the southeastern part of the survey area. All of this unit is south of the Milk River. Slopes range from 0 to 45 percent.

This unit makes up about 16 percent of the survey area. It consists of about 25 percent Vida soils, 20 percent Bearpaw soils, 15 percent Zahill soils, and 40 percent minor soils, including Cabba, Dimmick, Elloam, Nishon, and Williams soils.

Vida soils are undulating to hilly and are clay loam throughout.

Bearpaw soils are nearly level to gently rolling and are clay loam throughout.

Zahill soils are strongly rolling to steep and are clay loam throughout.

The soils in this map unit are used for dryland and irrigated crops and for range. Wheat and barley are the main dryland crops. Wheat, barley, and alfalfa hay are the main irrigated crops. Large areas of these soils are used for range. The native vegetation is mainly wild grasses.

The soils have good potential for habitat for wildlife, including pronghorn antelope, mule deer, and other mammals and pheasants, sharp-tailed grouse, gray (Hungarian) partridge, and nongame birds.

7. Bearpaw-Vida-Elloam

Nearly level to gently rolling, deep, well drained clay loams; moderately sodium-affected in some areas

This map unit is on the glaciated plains in the central part of the survey area. Slopes range from 0 to 8 percent.

This unit makes up about 1 percent of the survey area. It consists of about 40 percent Bearpaw soils, 25 percent Vida soils, 15 percent Elloam soils, and 20 percent minor soils, including Creed, Korent, Savage, and Straw soils.

Bearpaw soils are nearly level to gently rolling and clay loam throughout.

Vida soils are undulating and gently rolling and clay loam throughout.

Elloam soils are nearly level and gently sloping. They are clay loam throughout and are moderately sodium-affected.

The soils in this unit are used for dryland and irrigated crops and for range. Wheat and barley are the main

dryland crops. Wheat, barley, and alfalfa hay are the main irrigated crops. Large areas are used for range. The native vegetation is mainly mid grasses.

The soils have good potential for the development of habitat for wildlife, including pronghorn antelope, mule deer, and other mammals and pheasants, sharp-tailed grouse, gray (Hungarian) partridge, and nongame birds.

nearly level to steep, deep, well drained and excessively drained soils on terraces and fans

The soils in this group are on terraces and fans on uplands. They formed in alluvium. The average annual precipitation ranges from 10 to 19 inches, and the frost-free period is 100 to 125 days. These soils are used mainly for range and for dryland crops. The native vegetation is mainly mid and short grasses.

There are three map units in this group.

8. Attewan-Wabek-Beaverell

Nearly level to steep, deep, well drained and excessively drained loams and gravelly loams

This map unit is on terraces and fans in the northeastern part of the survey area. Slopes range from 0 to 35 percent.

This unit makes up about 2 percent of the survey area. It consists of about 45 percent Attewan soils, 20 percent Wabek soils, 10 percent Beaverell soils, and 25 percent minor soils, including Assinniboine, Chinook, and Joplin soils.

The Attewan soils are nearly level and gently sloping. They have a loam surface layer, a clay loam subsoil, and a clay loam substratum over gravelly loamy sand at a depth of 25 inches.

The Wabek soils are undulating to steep. The surface layer is gravelly loam, and the underlying material is very gravelly coarse sand.

The Beaverell soils are nearly level and gently sloping. The surface layer is gravelly loam. The subsoil is very gravelly clay loam and sandy clay loam. The substratum is very gravelly loamy sand and sand.

The soils in this map unit are used mainly for range and for dryland crops. A small acreage is used for irrigated wheat, barley, oats, and alfalfa hay. The main dry-farmed crops are wheat and barley. The native vegetation is mainly short and mid grasses.

The soils have good potential for habitat for pronghorn antelope and other mammals and nongame birds.

9. Martinsdale-Shawmut-Turner

Nearly level to gently rolling, deep, well drained clay loams, gravelly loams, and loams

This map unit is on terraces and fans in the south-central part of the survey area. Slopes range from 0 to 8 percent.

This unit makes up about 2 percent of the survey area. It consists of about 30 percent Martinsdale soils, 15

percent Shawmut soils, 15 percent Turner soils, and 40 percent minor soils, including Beaverton, Farnuf, Judith, Shaak, Windham, and Work soils.

Martinsdale soils are nearly level to gently rolling. They have a clay loam surface layer and a clay loam subsoil. The substratum is clay loam and gravelly clay loam.

Shawmut soils are nearly level to moderately sloping. They have a gravelly loam surface layer. The upper part of the subsoil is gravelly clay loam, and the lower part is very gravelly clay loam. The upper part of the substratum is very gravelly loam, and the lower part is extremely gravelly loam.

Turner soils are nearly level to gently rolling. The surface layer is loam, and the subsoil is clay loam and sandy clay loam. The substratum is clay loam and gravelly loam to a depth of 26 inches and, below that, very gravelly loamy sand to a depth of 60 inches.

The soils in this map unit are used for range and for dryland crops. A small acreage is used for irrigated alfalfa hay. The dryland crops are wheat, barley, and oats. The native vegetation is mainly mid and short grasses.

The soils have potential for the development of habitat for pronghorn antelope and other mammals and nongame birds.

10. Shaak-Attewan-Work

Nearly level to moderately sloping, deep, well drained loams and clay loams

This map unit is on terraces and fans in the southwestern part of the survey area. Slopes range from 0 to 8 percent.

This unit makes up about 1 percent of the survey area. It consists of about 30 percent Shaak soils, 25 percent Attewan soils, 25 percent Work soils, and 20 percent minor soils, including Beaverell, Gerdrum, Martinsdale, and Turner soils.

Shaak soils are nearly level and gently sloping. The surface layer is loam, and the subsoil is clay and clay loam. The substratum is gravelly sandy clay loam and very gravelly sandy loam.

Attewan soils are nearly level and gently sloping. The surface layer is loam, and the subsoil is clay loam. The substratum is clay loam to a depth of 25 inches. Below that, to a depth of 60 inches, it is very gravelly loamy sand.

Work soils are nearly level to moderately sloping. The surface layer is clay loam. The subsoil is clay in the upper part and clay loam in the lower part. The substratum is gravelly clay loam.

The soils in this map unit are used for range and for dryland and irrigated crops. The main dryland crops are wheat and barley. The main irrigated crops are wheat, barley, and alfalfa hay. The native vegetation is mainly mid and short grasses.

The soils have good potential for habitat for pronghorn antelope and other mammals and nongame birds.

gently sloping to very steep, shallow to deep, well drained soils on shale and sandstone uplands

These are soils of the uplands. They formed in material that weathered from shale and sandstone. The average annual precipitation ranges from 10 to 18 inches, and the frost-free period is 100 to 125 days. The soils are used mainly for range. In some areas they are used for dryland crops. The native vegetation is mainly mid and short grasses.

There are five map units in this group.

11. Cabbart-Delpoint

Undulating to steep, shallow to moderately deep, well drained loams

This map unit is on uplands in the southwestern part of the survey area. Slopes range from 2 to 35 percent.

This unit makes up about 2 percent of the survey area. It consists of about 35 percent Cabbart soils, 25 percent Delpoint soils, and 40 percent minor soils, including Dilts, Lisam, Marmarth, Riedel, Twilight, and Yamac soils. Small areas of shale outcrop and sandstone outcrop are also included.

Cabbart soils are undulating to steep. The surface layer is loam, and the underlying material is loam. Soft siltstone bedrock is at a depth of 12 inches.

Delpoint soils are undulating to strongly rolling. The surface layer and subsoil are loam. The substratum is clay loam. Soft siltstone bedrock is at a depth of 32 inches.

The soils in this map unit are used mainly for range. A small acreage is used for dryland crops. The main dryland crops are wheat and barley. The native vegetation is mainly mid and short grasses.

The soils have good potential for use as habitat for pronghorn antelope, mule deer, and other mammals and sage grouse, sharp-tailed grouse, and nongame birds.

12. Barkof-Cabba-Windham

Undulating to steep, shallow to deep, well drained clay loams and gravelly loams

This map unit is on uplands in the southeastern part of the survey area. Slopes range from 2 to 45 percent.

This unit makes up about 2 percent of the survey area. It consists of about 40 percent Barkof soils, 25 percent Cabba soils, 20 percent Windham soils, and 15 percent minor soils, including Castner, Farnuf, Marvan, Norbert, Perma, and Vanda soils. Small areas of shale outcrop and sandstone outcrop are included.

Barkof soils are undulating to steep. The surface layer and subsoil are clay. Shale bedrock is at a depth of 28 inches.

Cabba soils are strongly rolling to steep. The surface layer and underlying material are loam. Soft siltstone bedrock is at a depth of 12 inches.

Windham soils are gently rolling to steep. The surface layer is gravelly loam. The subsoil and substratum are very gravelly loam.

The soils in this map unit are used mainly for range. A small acreage is used for dryland crops of wheat and barley and irrigated crops of alfalfa hay. The native vegetation is mainly mid and short grasses and shrubs. Ponderosa pine grows in some areas.

The soils have good potential for use as habitat for pronghorn antelope, mule deer, and other mammals and sage grouse, sharp-tailed grouse, and nongame birds.

13. Lisam-Dilts-Bascovy

Gently sloping to steep, shallow to moderately deep, well drained clays

This map unit is on uplands in the southern part of the survey area. Slopes range from 2 to 35 percent.

This unit makes up about 4 percent of the survey area. It consists of about 30 percent Lisam soils, 25 percent Dilts soils, 15 percent Bascovy soils, and 30 percent minor soils, including Marvan, Nobe, and Vanda soils. Small areas of shale outcrop are included.

Lisam soils are gently rolling to steep. The surface layer and the underlying material are clay. Shale bedrock is below a depth of 17 inches.

Dilts soils are gently rolling to steep. The surface layer and the underlying material are clay. Shale bedrock is below a depth of 16 inches.

Bascovy soils are gently sloping and moderately sloping. The surface layer, subsoil, and substratum are clay. Shale bedrock is at a depth of 23 inches.

The soils in this unit are used mainly for range. The native vegetation is mainly mid and short grasses and shrubs.

The soils have good potential for use as habitat for pronghorn antelope, mule deer, and other mammals and for sage grouse, sharp-tailed grouse, and nongame birds.

14. Lisam-Dilts-Rock outcrop, shale

Steep, shallow, well drained clays and steep and very steep shale outcrops

This map unit is on uplands mainly in the southwestern part of the survey area. Slopes range from 25 to 60 percent.

This unit makes up about 5 percent of the survey area. It consists of about 30 percent Lisam soils, 25 percent Dilts soils, 25 percent Rock outcrop, shale and 20 percent minor soils, including Bascovy, Marvan, Nobe, and Vanda soils.

Lisam soils are steep and are mainly on hills and ridges. The surface layer and underlying material are clay. Shale bedrock is below a depth of 17 inches.

Dilts soils are steep and are on hills and ridges. The surface layer and underlying material are clay. Shale bedrock is below a depth of 16 inches.

The areas of shale outcrops are steep and very steep. They are on the sides of hills and ridges and along deeply eroded drainageways.

The soils in this map unit are used for range. The native vegetation is mainly short and mid grasses and shrubs. Ponderosa pine and juniper grow in some areas.

The soils have good potential for habitat for wildlife, including pronghorn antelope, mule deer, and other mammals and sage grouse, sharp-tailed grouse, and nongame birds.

15. Badland-Cabbart

Steep and very steep badlands and moderately steep to very steep, shallow, well drained loams

This map unit is in the southwestern part of the survey area. Slopes range from 15 to 70 percent.

This unit makes up about 4 percent of the survey area. It consists of about 40 percent Badland, 20 percent Cabbart soils, and 40 percent minor soils, including Delpoint, Lisam, Riedel, and Twilight soils. Areas of Rock outcrop, shale, are included.

Badland is on steep and very steep canyon walls, eroded areas along drainageways and ridges, and bluffs along the Missouri River.

Cabbart soils are moderately steep to very steep. The surface layer and the underlying material are loam. Soft siltstone bedrock is at a depth below 12 inches.

The soils in this map unit are used for range. The native vegetation of short and mid grasses, shrubs, ponderosa pine, and juniper is mainly on the Cabbart soils and the minor soils.

The soils have good potential for habitat for wildlife, including mule deer, white-tailed deer, elk, and other mammals and sharp-tailed grouse and nongame birds.

gently sloping to very steep, shallow to deep, well drained soils on mountains

These are soils of the mountains. They formed in material that weathered from igneous limestone, sandstone, and other metamorphic rock. The average annual precipitation ranges from 14 to 25 inches, and the frost-free period is 80 to 110 days. The soils are used mainly for range and woodland. In some areas they are used for dry-farmed and irrigated crops. A small amount of timber is produced on some of these soils.

There are two map units in this group.

16. Hedoes-Belain-Castner

Gently sloping to very steep, shallow to deep, well drained loams and gravelly loams

This map unit is mainly in the Bearpaw Mountains in the southwestern part of the survey area. Slopes range from 2 to 60 percent.

This unit makes up about 9 percent of the survey area. It consists of about 25 percent Hedoes soils, 20 percent Belain soils, 20 percent Castner soils, and 35 percent minor soils, including Benz, Farnuf, and Perma soils. Areas of Rock outcrop, shale, are included.

Hedoes soils are gently sloping to steep. The surface layer and subsoil are loam. The substratum is coarse

sandy loam in the upper part and very gravelly coarse sandy loam in the lower part.

Belain soils are gently sloping to steep. The surface layer is loam, and the subsoil is loam and gravelly loam. The substratum is gravelly and very gravelly loam. It is underlain by igneous bedrock at a depth of 28 inches.

The Castner soils are strongly sloping to very steep. The surface layer is gravelly loam. The underlying material is very channery loam. Hard sandstone bedrock is at a depth below 13 inches.

The soils in this map unit are used mainly for range. In some small areas they are used for dryland and irrigated crops. The main dryland crops are wheat and barley. The main irrigated crops are wheat, barley, and alfalfa hay. The native vegetation is mid and short grasses. Ponderosa pine is growing on some of the soils.

The soils in this unit have good potential for use as habitat for wildlife, including elk, mule deer, white-tailed deer, and other mammals and Merriam's turkey, blue grouse, and nongame birds.

17. Whitecow-Macmeal-Warneke

Steep and very steep, shallow and deep, well drained gravelly loams

This map unit is mainly in the Little Rocky Mountains in the southeastern part of the survey area. Slopes range from 25 to 70 percent.

This unit makes up about 1 percent of the survey area. It is about 45 percent Whitecow soils, 20 percent Macmeal soils, 10 percent Warneke soils, and 25 percent minor soils, including Castner, Lolo, and Silverchief soils. Small areas of rock outcrop are included.

Whitecow soils are steep and very steep. The surface layer is gravelly loam, the subsoil is very gravelly loam, and the substratum is extremely gravelly loam.

Macmeal soils are steep and very steep. The surface layer is gravelly loam. The subsoil is very gravelly clay loam and extremely channery loam to a depth of 60 inches.

Warneke soils are steep and very steep. The surface layer is gravelly loam, and the subsoil is very channery loam. Limestone bedrock is at a depth of 15 inches.

The soils in this map unit are used mainly as rangeland. They have limited use for timber production.

These soils have good potential for use as habitat for wildlife, including elk, mule deer, white-tailed deer, and other mammals and Merriam's turkey, blue grouse, and nongame birds.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

For this survey, soils were mapped at two levels of detail. The soils mapped in greater detail are called narrowly defined map units. Those mapped in lesser detail are called broadly defined map units. The boundaries of the narrowly defined map units were plotted and verified at closely spaced intervals. The boundaries of the broadly defined map units were plotted and verified at greater intervals. The intensity of mapping for a given soil was based on the anticipated long-term use of the soil. The broadly defined map units are identified by an asterisk in the soil legend.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hedoes loam, 2 to 4 percent slopes, is one of several phases in the Hedoes series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The

pattern and proportion of the soils are somewhat similar in all areas. Chinook-Phillips complex, 2 to 6 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Cabba-Zahill association, steep, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Havre, Hanly and Glendive soils, channeled, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

1—Absher-Nobe complex, 0 to 4 percent slopes.

This complex consists of nearly level to gently sloping soils on fans and terraces on uplands throughout the survey area. These soils are at an elevation of 2,300 to 3,600 feet. The average annual precipitation is 12

inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Absher soil makes up about 60 percent of this map unit, and the Nobe soil makes up about 30 percent. Included with these soils in mapping are small areas of Benz, Creed, and Vanda soils. These soils make up about 10 percent of this unit.

The Absher soil is deep and moderately well drained. It formed in alluvium, and it is in smooth areas. Typically, the surface layer, where mixed, is light brownish gray clay loam to a depth of 7 inches. The subsoil is grayish brown clay 13 inches thick. The substratum is grayish brown clay loam to a depth of 40 inches; below that, it is clay loam stratified with lenses of loam and silty clay loam to a depth of 60 inches.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in those areas that are in native vegetation is 29 inches. Runoff is slow. Wind erosion is a moderate hazard and water erosion a slight hazard. The subsoil, in the lower 11 inches, is strongly affected by sodium. When dry, it is very hard, and it hinders the penetration of roots and moisture.

The Nobe soil is deep and moderately well drained. It formed in alluvium in depressions on fans and terraces. Typically, the surface layer, where mixed, is grayish brown clay to a depth of 7 inches. The substratum is grayish brown clay to a depth of 30 inches; below that, it is olive silty clay to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 60 inches, but the subsoil, which is strongly affected by sodium, is very hard when dry and thus hinders root penetration. The average annual wetting depth of the soil in those areas that are in native vegetation is 20 inches. Runoff is slow. The wind erosion is a moderate hazard, and water erosion is a slight hazard.

Because the soils in this complex are strongly affected by sodium, they are poorly suited to cultivated crops.

These soils are suited to use as rangeland, and they are used as rangeland. Most of the forage is produced on the Absher soil.

The potential plant community on the Absher soil consists mainly of western wheatgrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. On the Nobe soil it is western wheatgrass, prairie junegrass, inland saltgrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants, such as western wheatgrass, Nuttall alkaligrass, and Nuttall saltbush, and an increase of plants such as inland saltgrass, shrubby cinquefoil, foxtail barley, broom snakeweed, plains pricklypear, and curlycup gumweed.

On the Absher soil, the potential plant community produces 400 pounds of forage per acre in favorable years and 100 pounds per acre in unfavorable years. On the Nobe soil, forage production is 200 pounds per acre

in favorable years and 75 pounds per acre in unfavorable years.

The Absher and Nobe soils are not suitable for windbreaks because they are strongly affected by sodium.

The very slow permeability, low soil strength, and high shrink-swell potential limit these soils for most urban uses. Septic tank absorption fields require special design because of the very slow permeability. Foundations and basements for houses require special design because of the shrink-swell potential and low soil strength.

Capability subclass VIs, dryland. Absher soil: Dense Clay range site, 10- to 14-inch precipitation zone; Nobe soil: Saline Upland range site, 10- to 14-inch precipitation zone.

2—Assinniboine fine sandy loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil that formed in alluvium or eolian materials on glaciated uplands. It is at an elevation of 2,500 to 3,500 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown fine sandy loam 5 inches thick. The upper part of the subsoil is brown fine sandy loam about 4 inches thick. The lower part is brown sandy clay loam 12 inches thick. The substratum is grayish brown fine sandy loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil where it is under native vegetation is 36 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard.

Small areas of Cozberg and Chinook soils are included with this soil in mapping.

The Assinniboine soil is used mainly as rangeland. In some areas it is used for dryland crops, mainly wheat, barley, and oats.

Wind erosion is the main limitation to use of this soil for cultivated crops. Effective methods for controlling wind erosion include strip cropping, tall grass barriers, minimum tillage, and stubble mulch tillage. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, needleandthread, western wheatgrass, and forbs. If the rangeland is overgrazed, Indian ricegrass and prairie sandreed decrease and prairie junegrass, needleandthread, blue grama, and fringed sagewort increase. Annual grasses and clubmoss are likely to invade. The potential heavy infestation by clubmoss is a very serious problem.

The potential plant community produces 1,600 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses. Underground water supplies can be polluted by liquid and solid waste disposal systems because of the moderately rapid permeability of the underlying material.

Capability subclass IIIe, dryland; Sandy range site, 10- to 14-inch precipitation zone.

3—Attewan loam, 0 to 4 percent slopes. This soil is deep and well drained. It formed in alluvium on outwash terraces in the uplands at an elevation of 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is brown loam 6 inches thick. The subsoil is brown and grayish brown clay loam 14 inches thick. The upper part of the substratum is light brownish gray loam 5 inches thick, and the lower part, to a depth of 60 inches or more, is grayish brown, very gravelly loamy sand. A layer of sand and gravel is at a depth of 20 to 40 inches.

Permeability is moderate above the layer of sand and gravel and rapid or very rapid in that layer. The available water capacity is moderate or low. The root zone extends to a depth of about 30 inches. The average annual wetting depth of the soil in areas that are in native vegetation is about 30 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is droughty.

Small areas of Beaverell and Wabek soils are included in mapping. The Beaverell soil is nearly level and gently sloping. The Wabek soil is gently sloping, and it is on mounds or low knolls.

This soil is used mainly for range and for dryland crops, mainly wheat, barley, and oats. In some small areas it is used for irrigated crops, mainly wheat, barley, oats, and alfalfa.

Wind erosion and droughtiness are the main limitations to the use of this soil for cultivated crops. Stripcropping, tall grass barriers, minimum tillage, and mulch tillage help control wind erosion. Crop residue left on the surface, minimum tillage, and tall grass barriers for trapping windblown snow help to conserve moisture.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease; needleandthread, blue grama, and fringed sagewort increase; and annual grasses, broom snakeweed, and clubmoss invade.

The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil is suited to windbreaks. The moderate or low available water capacity restricts the choice of trees and shrubs to those that are drought-resistant. Russian-olive, Siberian elm, Siberian crabapple, green ash, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper are suitable trees. Siberian peashrub, common chokecherry, American plum, and silver buffaloberry are suitable shrubs.

This soil is suited to most urban uses. Because of the rapid or very rapid permeability of the substratum, waste disposal systems can pollute underground water supplies.

Capability subclass is IIIs, dryland, and IIs, irrigated; Silty range site, 10- to 14-inch precipitation zone.

4—Attewan-Beaverell complex, 0 to 4 percent slopes. This complex consists of Attewan and Beaverell soils on outwash terraces in the uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Attewan soil makes up about 55 percent of this map unit, and the Beaverell soil makes up about 30 percent. Included in mapping are small areas of Chinook and Wabek soils, which together make up about 15 percent of the map unit.

The Attewan soil is deep and well drained. It formed in alluvium on the smooth parts of terraces. Typically, the surface layer is brown loam 6 inches thick. The subsoil is brown and grayish brown clay loam 14 inches thick. The substratum in the upper 5 inches, is light brownish gray clay loam. Below that, to a depth of 60 inches or more, it is grayish brown, very gravelly loamy sand. A layer of sand and gravel is at a depth of 20 to 40 inches.

Permeability is moderate above the layer of sand and gravel and rapid or very rapid in that layer. The available water capacity is moderate. The root zone extends to a

depth of about 30 inches. The average annual wetting depth of the soil where it is under native vegetation is 30 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is droughty.

The Beaverell soil is deep and well drained. It formed in alluvium on low knolls and ridges. Typically, the surface layer is brown gravelly loam 3 inches thick. The subsoil is brown gravelly clay loam and very gravelly sandy clay loam 8 inches thick. The upper part of the substratum is brown very gravelly sandy loam 6 inches thick; the lower part is brown gravelly sand to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and rapid or very rapid below that depth. The available water capacity is very low. The root zone extends to a depth of about 20 inches. The average annual wetting depth of the soil where it is under native vegetation is 20 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. Very gravelly sand is at a depth of 10 to 20 inches.

The soils in this complex are used mainly for range and for dryland crops, mainly wheat, barley, and oats. In some small areas they are used for irrigated crops, mainly wheat, barley, oats, and alfalfa.

Wind erosion and droughtiness are the main limitations to the use of these soils for cultivated crops. Stripcropping, tall grass barriers, minimum tillage, and mulch tillage help control wind erosion. Crop residue left on the surface, minimum tillage, and tall grass barriers for trapping windblown snow help to conserve moisture. The Beaverell soil especially is poorly suited to cultivated crops because it is very droughty. Yields are very low if the soil is cropped.

These soils are suited to use as rangeland. The potential plant community on the Attewan soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. The potential plant community on the Beaverell soil consists mainly of needleandthread, western wheatgrass, and prairie sandreed. Some forbs and woody plants are decreaseers. If the rangeland is overgrazed, needleandthread, prairie sandreed, and green needlegrass decrease; blue grama, fringed sagewort, and prairie junegrass increase; and annual grasses, red threeawn, broom snakeweed, and clubmoss invade.

On the Attewan soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Beaverell soil, forage production is 900 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows

desirable native plants to become reestablished, and thus forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting. The expected yield of forage is good for the Attewan soil and fair or poor for the very droughty Beaverell soil.

These soils are suited to windbreaks. Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper are suitable trees on the Attewan soil. Siberian peashrub, common chokecherry, American plum, and silver buffaloberry are suitable shrubs. Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper are suitable trees on the Beaverell soil. Siberian peashrub, silver buffaloberry, and sandcherry are suitable shrubs. The Beaverell soil has a very low available water capacity, which restricts the choice of shrubs and trees to those that are drought resistant.

The soils in this complex are suited to most urban uses. Because of the rapid or very rapid permeability of the substratum, waste disposal systems can pollute underground water supplies.

Capability subclass IVs, dryland, and IIIs, irrigated. The Attewan soil is in Silty range site, 10- to 14-inch precipitation zone; the Beaverell soil is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

5—Attewan-Wabek complex, 0 to 4 percent slopes.

This complex consists of Attewan and Wabek soils on outwash terraces in the uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Attewan soil makes up about 55 percent of the map unit, and the Wabek soil makes up 30 percent. Included in mapping are small areas of Beaverell and Chinook soils. These soils make up about 15 percent of this map unit.

The Attewan soil is deep and well drained. It formed in alluvium on the smooth parts of terraces. Typically, the surface layer is brown loam 6 inches thick. The subsoil is brown and grayish brown clay loam 14 inches thick. The substratum, in the upper 5 inches, is light brownish gray clay loam. Below that, to a depth of 60 inches or more, it is grayish brown, very gravelly loamy sand. A layer of sand and gravel is at a depth of 20 to 40 inches.

Permeability is moderate to a depth of about 25 inches and rapid or very rapid below that. The available water capacity is moderate. The root zone extends to a depth of about 30 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Surface runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. Very gravelly loamy sand is at a depth of 20 to 40 inches. This soil is droughty.

The Wabek soil is deep and excessively drained. It formed in alluvium on low knolls and ridges. Typically,

the surface layer is dark grayish brown and dark brown gravelly loam 8 inches thick. The upper part of the substratum is light brownish gray, very gravelly loamy coarse sand 7 inches thick. The lower part, to a depth of 60 inches or more, is grayish brown, very gravelly coarse sand.

Permeability is very rapid. The available water capacity is very low. The root zone extends to a depth of about 20 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Surface runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. Very gravelly coarse sand is at a depth of 6 to 14 inches. This soil is very droughty.

The soils in this complex are used mainly as rangeland. The potential plant community on the Attewan soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. The potential plant community on the Wabek soil consists mainly of needleandthread, western wheatgrass, and prairie sandreed. Some forbs and woody plants are decreasers. If the rangeland is overgrazed, needleandthread, prairie sandreed, and green needlegrass decrease; blue grama, fringed sagewort, and prairie junegrass increase; and annual grasses, red threeawn, clubmoss, and broom snakeweed invade.

On the Attewan soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Wabek soil, forage production is 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting. The expected yield of forage is good for the Attewan soil and fair or poor for the very droughty Wabek soil.

The Attewan soil is suited to windbreaks. The Wabek soil is not suited to windbreaks because it is very droughty. Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper are suitable trees on the Attewan soil. Siberian peashrub, common chokecherry, American plum, and silver buffaloberry are suitable shrubs.

The soils in this complex are suited to most urban uses. Because of the rapid or very rapid permeability of the substratum of the Attewan soil and the very rapid permeability of the substratum of the Wabek soil, waste disposal systems can pollute underground water supplies.

Capability subclass IVs, dryland. The Attewan soil is in Silty range site, 10- to 14-inch precipitation zone; the Wabek soil is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

6—Badland. This is a miscellaneous area consisting of barren land that is characterized by escarpments, narrow ridges, buttes, and deeply entrenched coulees. The elevation is 2,300 to 3,800 feet. Slopes range from 35 to 70 percent. This landscape was formed by the geologic erosion of soft, sedimentary bedrock.

Included in mapping are small areas of Cabbart and Lisam soils. These soils make up about 25 percent of this map unit.

Surface runoff is very rapid, and the hazard of erosion by wind and water is very severe.

Badland is used mainly as wildlife habitat and watershed and for recreation. The included soils support grasses, forbs, and shrubs and, in accessible areas, have limited use as rangeland. Grazing is difficult to manage. Extreme care must be used to prevent overgrazing and erosion.

7—Barkof clay, 4 to 8 percent slopes. This is a moderately deep, well drained soil on uplands. It formed in material that weathered from soft clayey shale. The elevation is 2,500 to 4,400 feet. Slopes are mainly short. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark grayish brown clay 7 inches thick. The subsoil is mostly grayish brown clay 21 inches thick. Below that, to a depth of 60 inches, there is platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 28 inches. Surface runoff is medium, and erosion by wind and water is a moderate hazard. Platy shale is at a depth of 20 to 40 inches.

Small areas of Norbert, Marvan, and Vanda soils are included in mapping. The Norbert soil is shallow and moderately and strongly sloping; it is on low knolls and ridges. The Vanda soil is gently and moderately sloping and strongly affected by sodium. It is on foot slopes and fans.

The Barkof soil is used mainly as rangeland. In some areas it is used for dryland crops, mainly wheat, barley, and oats.

Droughtiness and erosion by wind and water are the main limitations to the use of this soil for cultivated crops. Because of droughtiness, successful crop production is dependent on a suitable distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall-grass barriers for trapping windblown snow help to conserve moisture. Stripcropping, tall-grass barriers, minimum tillage, and stubble mulch tillage help control erosion by wind and water.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass. Some sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease; western wheatgrass, Idaho fescue, plains muhly, fringed sagewort, common snowberry, Woods rose, and big sagebrush increase; and Kentucky bluegrass, timothy, annual grasses, curlycup gumweed, and Hood phlox invade.

The potential plant community produces 2,400 pounds per acre of forage in favorable years and 1,300 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil is suited to windbreaks. The low available water capacity restricts the choice of shrubs and trees to those that are drought resistant. Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper are suitable trees. Siberian peashrub, silver buffaloberry, and sandcherry are suitable shrubs.

This soil is limited for most urban uses. Septic tank absorption fields require special design to overcome the limitations imposed by the slow permeability and the platy shale. Foundations and basements for houses require special design to overcome the limitations imposed by the shrinking and swelling of the soil and the low strength of the soil.

Capability subclass IIIe, dryland; Clayey range site, 15- to 19-inch precipitation zone.

8—Barkof-Norbert clays, 2 to 8 percent slopes.

This complex consists of Barkof and Norbert soils on uplands. The elevation is 2,500 to 4,400 feet. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Barkof soil makes up about 50 percent of the map unit, and the Norbert soil makes up 35 percent. Included in mapping are small areas of Vanda and Marvan soils. These soils make up about 15 percent of this map unit. The Vanda soil is undulating and gently rolling and is strongly affected by sodium. It is on fans and foot slopes.

The Barkof soil is moderately deep and well drained. It formed in material that weathered from soft clayey shale; it is on the lower side slopes of knolls. Typically, the surface layer is dark grayish brown clay 7 inches thick. The subsoil is mostly grayish brown clay 21 inches thick. Below that, to a depth of 60 inches, there is platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Surface runoff is medium, and the hazard of erosion by wind and water is moderate. Platy shale is at a depth of 20 to 40 inches.

The Norbert soil is shallow and well drained. It formed in material that weathered from soft clayey shale; it is on knolls and low ridges. Typically, the surface layer is mostly olive gray clay 10 inches thick. The substratum is olive gray very shaly clay 4 inches thick. Below that, to a depth of 60 inches, there is soft platy shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is very low. The effective rooting depth is about 14 inches. The average annual wetting depth of the soil under native vegetation is 14 inches. Surface runoff is medium, and the hazard of erosion by wind and water is moderate. Platy shale is at a depth of 10 to 20 inches.

This map unit is not suited to cultivated crops because the Norbert soil is shallow to platy shale and has a very low available water capacity.

These soils are used as rangeland. The potential plant community on the Barkof soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Canby bluegrass, sedge decreasers, and forbs. The potential plant community on the Norbert soil consists mainly of bluebunch wheatgrass, western wheatgrass, green needlegrass, and winterfat. Some forbs and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease; western wheatgrass, Idaho fescue, fringed sagewort, common snowberry, and big sagebrush increase; and Kentucky bluegrass, timothy, annual grasses, rubber rabbitbrush, curlycup gumweed, and Hood phlox invade.

On the Barkof soil, the potential plant community produces 2,400 pounds of forage per acre in favorable years and 1,300 pounds per acre in unfavorable years. On the Norbert soil, forage production is 1,600 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The Norbert soil is not suitable for windbreaks because its available water capacity is very low, but the Barkof soil is suitable. It has a low available water capacity, which restricts the choice of trees and shrubs to those that are drought resistant. Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper are suitable trees. Siberian peashrub, sandcherry, and silver buffaloberry are suitable shrubs.

These soils are limited for most urban uses. Foundations and basements for houses require special design to overcome the limitations imposed by a high shrink-swell potential and low strength. Septic tank absorption fields require special design to overcome the limitations imposed by slow or very slow permeability and the shallowness or moderate depth to platy shale.

Capability subclass VIs, dryland. The Barkof soil is in Clayey range site, 15- to 19-inch precipitation zone; the Norbert soil is in Shallow Clay range site, 15- to 19-inch precipitation zone.

9—Barkof-Norbert clays, 8 to 20 percent slopes.

This complex consists of Barkof and Norbert soils on uplands. The elevation is 2,500 to 4,400 feet. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Barkof soil makes up about 40 percent of the map unit, and the Norbert soil makes up about 40 percent. Included in mapping, and making up about 20 percent of this map unit, are small areas of Judith, Marvan, and Windham soils and some areas of shale outcrop. The shale outcrop is on hillsides and eroded areas along drainage ways.

The Barkof soil is moderately deep and well drained. It formed in material that weathered from soft clayey shale; it is on the lower side slopes of hills. Typically, the surface layer is dark grayish brown clay 7 inches thick. The subsoil is mostly grayish brown clay 21 inches thick. Below that, to a depth of 60 inches, there is platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is low. The root zone extends to a depth of about 28 inches. The average annual wetting depth of the soil where it is under native vegetation is 28 inches. Surface runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Platy shale is at a depth of 20 to 40 inches.

The Norbert soil is shallow and well drained. It formed in material that weathered from soft clayey shale, and it is on the upper side slopes of the knolls, hills, and ridges. Typically, the surface layer is mostly olive gray clay 10 inches thick. The substratum is olive gray, very shaly clay 4 inches thick. Below that, to a depth of 60 inches, there is platy shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is very low. The root zone extends to a depth of about 14 inches. The average annual wetting depth of the soil where it is under native vegetation is 14 inches. Surface runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Platy shale is at a depth of 10 to 20 inches.

This map unit is not suited to cultivated crops because the Norbert soil is shallow to platy shale and its available water capacity is very low.

The soils in this map unit are used as rangeland. The potential plant community on the Barkof soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Canby bluegrass. Sedges and forbs are decreasers. The potential plant community on the Norbert soil consists mainly of bluebunch wheatgrass, western wheatgrass, green needlegrass, and winterfat. Some forbs and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease; western wheatgrass, Idaho fescue, fringed sagewort, common snowberry, and big sagebrush increase; and Kentucky bluegrass, timothy, annual grasses, rubber rabbitbrush, curlycup gumweed, and Hood phlox invade.

On the Barkof soil, the potential plant community produces 2,400 pounds of forage per acre in favorable years and 1,300 pounds per acre in unfavorable years. On the Norbert soil, forage production is 1,600 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The soils are suited to the use of machinery in preparing a seedbed and in planting. Minimum soil disturbance and planting across the slope help control runoff and water erosion. A permanent and adequately maintained cover of natural grasses also helps to control water erosion.

These soils are not suited to windbreaks. The Barkof soil has a low available water capacity, and the Norbert soil has a very low available water capacity and is shallow.

These soils are very poorly suited to timber production. There are, however, some ponderosa pine and limber pine of merchantable quality on north- and east-facing side slopes.

These soils are limited for most urban uses. Septic tank absorption fields require special design to overcome the limitations imposed by the slow and very slow permeability, the platy shale, and the slope. Foundations and basements for houses require special design to overcome the limitations imposed by the shrinking and swelling of the soils, the low strength of the soils, and the platy shale.

Capability subclass Vle, dryland. The Barkof soil is in Clayey range site, 15- to 19-inch precipitation zone; the Norbert soil is in Shallow Clay range site, 15- to 19-inch precipitation zone.

10—Barkof-Windham association, moderately steep. This association consists of Barkof soil below the edges of terraces and Windham soil on the edges of terraces on uplands. The elevation is 3,200 to 4,400 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Barkof soil makes up about 60 percent of the map unit, and the Windham soil makes up 25 percent. Included in mapping, and making up about 15 percent of the map unit, are small areas of Marvan and Norbert soils and shale outcrop. The shale outcrop is on the upper part of the side slopes below the edges of the terraces.

The Barkof soil is moderately deep and well drained. It formed in material weathered from soft clayey shale. Typically, the surface layer is dark grayish brown clay 7 inches thick. The subsoil is mostly grayish brown clay 21 inches thick. Below that, to a depth of 60 inches, there is platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 28 inches. Surface runoff is rapid. Wind erosion is a moderate hazard, and water

erosion is a severe hazard. Platy shale is at a depth of 20 to 40 inches.

The Windham soil is deep and well drained. It formed in alluvium. Typically, the surface layer is dark grayish brown gravelly loam 6 inches thick. The substratum, to a depth of 60 inches, or more, is pale brown very gravelly loam.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 30 inches. Surface runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. This soil is droughty because of the large amount of rock fragments in the profile.

The soils in this association are not suited to cultivated crops because of steep slopes and droughtiness.

A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

The soils are used as rangeland. The potential plant community consists mainly of rough fescue, western wheatgrass, bluebunch wheatgrass, and little bluestem. Some sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, rough fescue and bluebunch wheatgrass decrease; Idaho fescue, needleandthread, blue grama, prairie junegrass, big sagebrush, and threadleaf sedge increase; and clubmoss, annual grasses, Hood phlox, and pussytoes invade.

On the Barkof soil, the potential plant community produces 2,400 pounds of forage per acre in favorable years and 1,300 pounds per acre in unfavorable years. On the Windham soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The soils in this association are not suited to windbreaks because of slope.

The soils are very poorly suited to timber production. There are, however, a few ponderosa pine trees of merchantable quality on north- and east-facing side slopes.

These soils are limited for most urban uses by slope.

Capability subclass Vle, dryland. The Barkof soil is in Clayey range site, 15- to 19-inch precipitation zone; the Windham soil is in Thin Hilly range site, 15- to 19-inch precipitation zone.

11—Bascovy clay, 2 to 6 percent slopes. This soil is moderately deep and well drained. It formed on uplands in material that weathered from soft clayey shale. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is grayish brown clay 6 inches thick; it has a thin, light brownish gray, vesicular crust. The subsoil is olive gray clay 9 inches thick. The substratum is olive gray clay 8 inches thick. Below that,

to a depth of 60 inches, there is olive gray and olive brown, soft clayey shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is low. The root zone extends to a depth of about 23 inches. The average annual wetting depth of the soil under native vegetation is 23 inches. Surface runoff is medium, and the hazard of erosion by wind and water is moderate. Soft clayey shale is at a depth of 20 to 40 inches.

Small areas of Dilts, Lisam, Marvan, and Vanda soils are included in mapping. Dilts and Lisam soils are gently sloping and moderately sloping; they are on small knolls and ridges. They are 10 to 20 inches deep to shale, and they are droughty. The Vanda soil is gently and moderately sloping; it is on foot slopes and fans. It is strongly sodium-affected and is subject to surface crusting if farmed. The crusting restricts seedling emergence and reduces crop yields. The Marvan soil is moderately sodium-affected.

The Bascovy soil is used mainly for range. In some areas it is used for dryland crops, mainly wheat and barley.

Droughtiness and erosion by wind and water are the main limitations in using this soil for cultivated crops. Because of droughtiness, successful crop production depends on a suitable distribution of rainfall during the growing season. Stripcropping, tall grass barriers for trapping windblown snow, minimum tillage, and stubble mulch tillage help to conserve moisture and control erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, thickspike wheatgrass, Canby bluegrass, Nuttall saltbush, and forbs. If the rangeland is overgrazed, western wheatgrass, green needlegrass, and Nuttall saltbush decrease; prairie junegrass and inland saltgrass increase; and foxtail barley, curlycup gumweed, plains pricklypear, and broom snakeweed invade.

The potential plant community produces 1,300 pounds per acre of forage in favorable years and 700 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil is suited to windbreaks. The low available water capacity restricts the choice of shrubs and trees to those that are drought resistant. Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper are suitable trees. Siberian peashrub, silver buffaloberry, and western sandcherry are suitable shrubs.

This soil is limited for most urban uses. Septic tank absorption fields require special design to overcome limitations imposed by the very slow permeability and the shallowness to shale. Foundations and basements for houses require special design to compensate for the high shrink-swell potential and low strength of the soil.

Capability subclass IVs, dryland; Clayey range site, 10- to 14-inch precipitation zone.

12—Bascovy-Lisam-Dilts clays, 2 to 8 percent slopes. This complex consists of undulating and gently rolling Bascovy soil and gently rolling Lisam and Dilts soils on uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Bascovy soil makes up about 40 percent of the map unit, the Lisam soil makes up 25 percent, and the Dilts soil makes up 25 percent. Included in mapping, and making up about 10 percent of the map unit, are small areas of Marvan and Vanda soils and shale outcrop.

The Bascovy soil is moderately deep and well drained. It formed on the lower slopes of knolls and ridges in material that weathered from soft clayey shale. Typically, the surface layer is grayish brown clay 6 inches thick; it has a thin, light brownish gray, vesicular crust. The subsoil is olive gray clay 9 inches thick. The substratum is olive gray clay 8 inches thick. Below that, to a depth of 60 inches, there is olive gray and olive brown, soft clayey shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 23 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 23 inches. Surface runoff is medium, and the hazard of erosion by wind and water is moderate. Soft clayey shale is at a depth of 20 to 40 inches.

The Lisam soil is shallow and well drained. It formed on the upper slopes of some knolls in material that weathered from soft clayey shale. Typically, the surface layer is grayish brown clay 6 inches thick. The upper part of the substratum is grayish brown clay 6 inches thick; the lower part is olive gray shaly clay 5 inches thick. Below that, to a depth of 60 inches, there is olive gray, soft, platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 17 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 17 inches. Surface runoff is medium, and the hazard of erosion by wind and water is moderate. Soft clayey shale is at a depth of 10 to 20 inches.

The Dilts soil is shallow and well drained. It formed on the upper slopes of some knolls in material that weathered from soft acid shale. Typically, the surface layer is grayish brown clay 3 inches thick; it has a thin, massive crust. The substratum is grayish brown clay 13 inches thick. Below that, to a depth of 60 inches, there is grayish brown, soft platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 16 inches. The average annual wetting depth of the soil under native vegetation is 16 inches. Surface runoff is medium, and the hazard of erosion by wind and water is moderate. Acid shales are at a depth of 10 to 20 inches.

This complex is not suited to cultivated crops because of the very low available water capacity of the Lisam and

Dilts soils. It is suited to use as rangeland. The potential plant community on the Bascovy soil consists mainly of western wheatgrass, Nuttall alkaligrass, Nuttall saltbush, forbs, and greasewood. The potential plant community on the Lisam and Dilts soils consists mainly of bluebunch wheatgrass, western wheatgrass, green needlegrass, little bluestem, and winterfat. Some forbs and woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass, western wheatgrass, green needlegrass, and Nuttall saltbush decrease; plains reedgrass, blue grama, onion, prairie junegrass, plains muhly, inland saltgrass, and big sage brush increase; and foxtail barley, greasewood, plains pricklypear, broom snakeweed, and curlycup gumweed invade.

On the Bascovy soil, the potential plant community produces 1,300 pounds of forage per acre in favorable years and 700 pounds per acre in unfavorable years. On the Lisam soil and on the Dilts soil, the forage production is 1,000 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The Lisam and Dilts soils are not suited to windbreaks because they have a very low available water capacity. The Bascovy soil is suited to windbreaks. Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper are suitable trees. Siberian peashrub, silver buffaloberry, and sandcherry are suitable shrubs.

The soils in this complex are limited for most urban uses. Septic tank absorption fields require special design to overcome the limitations imposed by the very slow permeability and soft shale bedrock. Foundations and basements for houses require special design to overcome the limitations imposed by the high shrink-swell potential and low strength of the soil and the platy shale.

Capability subclass VIs, dryland. The Bascovy soil is in Clayey range site, 10- to 14-inch precipitation zone; the Lisam and Dilts soils are in Shallow Clay range site, 10- to 14-inch precipitation zone.

13—Bearpaw clay loam, 0 to 4 percent slopes. This soil is deep and well drained. It formed in glacial till on glaciated uplands at an elevation of 2,600 to 3,800 feet. Slopes are mainly medium in length. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer, where mixed, is dark grayish brown clay loam to a depth of 7 inches. The subsoil is dark grayish brown and grayish brown clay loam 16 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under

native vegetation is 40 inches. Surface runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Dimmick, Nishon, Elloam, and Vida soils are included in mapping. Dimmick and Nishon soils are level or nearly level; they are in small enclosed basins that are subject to ponding. The Elloam soil is nearly level and undulating, and is in small, sparsely vegetated depressions. It is strongly sodium-affected. The Vida soil has undulating topography.

This soil is used mainly for dryland crops and range. The dryland crops are mainly wheat and barley. In some small areas the soil is used for irrigated alfalfa for hay.

Wind erosion is the main limitation to the use of this soil for cultivated crops. Stripcropping, mulch tillage, and leaving clods or ridges on the surface after tillage help control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Some sedges, woody plants, and forbs are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; Idaho fescue, needleandthread, western wheatgrass, prairie junegrass, fringed sagewort, common snowberry, and big sagebrush increase; and clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes invade.

The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years. This soil is suited to seeding.

Clubmoss is very competitive, and its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to windbreaks. Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir are suitable trees. Siberian peashrub, common chokecherry, American plum, Silver buffaloberry, and lilac are suitable shrubs.

This soil is limited for most urban uses. Septic tank absorption fields require special design to overcome the limitations imposed by the slow permeability.

Capability subclass IIe, dryland, and IIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

14—Bearpaw-Elloam clay loams, 0 to 4 percent slopes. This complex consists of nearly level to undulating Bearpaw and Elloam soils on glaciated uplands. The elevation is 2,600 to 3,800 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Bearpaw soil makes up about 65 percent of this map unit, and the Elloam soil makes up 20 percent. Included in mapping are small areas of Dimmick, Nishon, and Vida soils, which make up about 15 percent of the unit. Dimmick and Nishon soils are level or nearly level. They are in small enclosed basins that are subject to ponding.

The Bearpaw soil is deep and well drained. It formed in glacial till. Typically, the surface layer is mixed to a depth of 7 inches and is dark grayish brown clay loam. The subsoil is dark grayish brown and grayish brown clay loam 16 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil where it is under native vegetation is 40 inches. Surface runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Elloam soil is deep and well drained. It formed in glacial till in sparsely vegetated small depressions. Typically, the surface layer, where mixed, is grayish brown clay loam 7 inches thick. The subsoil is grayish brown clay loam 10 inches thick. The substratum, to a depth of 62 inches or more, is grayish brown and olive clay loam.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil where it is under native vegetation is 28 inches. Surface runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. The Elloam soil has a subsoil that is moderately affected by sodium at a depth of about 3 inches.

The soils in this complex are used for range and dryland farming. Dryland crops are mainly wheat, barley, and oats. Wind erosion limits the use of these soils for cultivated crops. Furthermore, the Elloam soil is subject to crusting and is moderately affected by sodium.

Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue help control wind erosion.

On the Elloam soil, leaving clods on the surface and increasing the content of organic matter help reduce surface crusting and improve seedling emergence.

The soils in this complex are suited to use as rangeland. Most of the forage for grazing is produced on the Bearpaw soil. The potential plant community on the Bearpaw soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, and western wheatgrass; some sedges, forbs, and woody plants are decreaseers. The potential plant community on the Elloam soil consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. Some forbs are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, Nuttall saltbush, and green needlegrass

decrease; Idaho fescue, needleandthread, prairie junegrass, inland saltgrass, fringed sagewort, and shrubby cinquefoil increase; and weedy plants such as clubmoss, Kentucky bluegrass, foxtail barley, greasewood, pussytoes, and pricklypear are likely to invade.

The potential plant community on the Bearpaw soil produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years. The potential plant community on the Elloam soil produces 900 pounds of forage per acre in favorable years and 400 pounds in unfavorable years.

Clubmoss is very competitive, and its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils are suited to seeding.

The soils in this complex are suited to windbreaks. For the Bearpaw soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. Because the Elloam soil is moderately affected by sodium, the choice of shrubs and trees is restricted to those that resist the effects of sodium. Suitable trees include Russian-olive and Siberian elm, and suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow and very slow permeability limits the soils for most urban uses. Septic tank absorption fields require special design to compensate for the permeability.

Capability subclass IIle, dryland. Bearpaw soil: Silty range site, 15- to 19-inch precipitation zone; Elloam soil: Dense Clay range site, 15- to 19-inch precipitation zone.

15—Bearpaw-Elloam clay loams, 4 to 8 percent slopes. This complex consists of Bearpaw and Elloam soils on glaciated uplands. The elevation is 2,600 to 3,800 feet. The average annual precipitation is 15 inches, and the average annual air temperature is 42 degrees F. The average growing season is 110 days.

The Bearpaw soil makes up about 60 percent of this map unit, and the Elloam soil makes up 20 percent. Included with these soils in mapping are small areas of Dimmick, Nishon, Zahill, and Vida soils. These soils make up about 20 percent of the map unit. Dimmick and Nishon soils are level or nearly level; they are in small enclosed basins that are subject to ponding. The Zahill soil is gently rolling and strongly rolling on the top of knolls and ridges.

The Bearpaw soil is deep and well drained. It formed in glacial till on convex slopes. Typically, the surface layer, where mixed, is dark grayish brown clay loam to a depth of 7 inches. The subsoil is dark grayish brown and

grayish brown clay loam 16 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 36 inches. Surface runoff is medium. Wind and water erosion are a moderate hazard.

The Elloam soil is deep and well drained. It formed in glacial till in small sparsely vegetated depressions. Typically, the surface layer, where mixed, is grayish brown clay loam to a depth of 7 inches. The subsoil is grayish brown clay loam 10 inches thick. The substratum, to a depth of 62 inches or more, is mostly grayish brown clay loam.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 28 inches. Surface runoff is medium. Wind and water erosion are a moderate hazard. The Elloam soil has a subsoil that is moderately affected by sodium at a depth of about 3 inches. This subsoil becomes very hard when dry and restricts the penetration of roots and moisture.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops, mainly wheat and barley.

Wind and water erosion limit the use of these soils for cultivated crops. Furthermore, the Elloam soil is subject to crusting. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue help control wind and water erosion. On the Elloam soil, roughening the surface and adding organic matter help to reduce surface crusting, increase water infiltration, and improve seedling emergence.

The soils are suited to use as rangeland. Most of the forage for grazing is produced on the Bearpaw soil. The potential plant community on the Bearpaw soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Some sedges, forbs, and woody plants are decreaseers. The potential plant community on the Elloam soil consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. Some forbs are decreaseers.

If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, Nuttall saltbush, and green needlegrass decrease; Idaho fescue, needleandthread, prairie junegrass, inland saltgrass, fringed sagewort, and shrubby cinquefoil increase; and weedy plants including clubmoss, Kentucky bluegrass, foxtail barley, greasewood, pussytoes, and plains pricklypear are likely to invade.

The potential plant community on the Bearpaw soil produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years. The potential plant community on the Elloam soil

produces 800 pounds of forage per acre in favorable years and 300 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to seeding.

The soils are suited to windbreaks. For the Bearpaw soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. Because the Elloam soil is moderately affected by sodium, the choice of shrubs and trees is restricted to those that resist the effects of sodium. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability of the Bearpaw soil and very slow permeability and low strength of the Elloam soil are limitations for most urban uses. Septic tank absorption fields require special design to compensate for the slow and very slow permeability.

Capability subclass IIle, dryland. Bearpaw soil: Silty range site, 15- to 19-inch precipitation zone; Elloam soil: Dense Clay range site, 15- to 19-inch precipitation zone.

16—Bearpaw-Vida clay loams, 0 to 4 percent slopes. This complex consists of Bearpaw and Vida soils on glaciated uplands. The elevation is 2,600 to 3,800 feet. The average annual precipitation is 15 inches, and the mean annual temperature is 42 degrees F. The average growing season is 110 days.

The Bearpaw soil makes up about 55 percent of this map unit, and the Vida soil makes up 35 percent. Included in mapping are small areas of Dimmick, Nishon, and Elloam soils. These soils make up about 10 percent of the map unit. Dimmick and Nishon soils are nearly level; they are in small enclosed basins that are subject to ponding. The Elloam soil is in sparsely vegetated small depressions. Its subsoil is moderately affected by sodium and becomes very hard when dry.

The Bearpaw soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is mixed to a depth of 7 inches and is dark grayish brown clay loam. The subsoil is dark grayish brown and grayish brown clay loam 16 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Surface runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Vida soil is deep and well drained. It formed in glacial till on the upper part of slopes. Typically, the surface layer is mixed to a depth of 7 inches and is dark grayish brown clay loam. The subsoil is mostly brown clay loam 7 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Surface runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The soils in this complex are used for dryland crops, irrigated alfalfa for hay, and range. Dryland crops are mainly wheat and barley.

Wind erosion is the main limitation to using these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue help control wind erosion.

The soils are suited to use as rangeland. The potential plant community on the Bearpaw and Vida soils consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, basin wildrye, and Idaho fescue. Some sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease; and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes are likely to invade.

The potential plant community of Bearpaw and Vida soils produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and, thus, forage production increases.

The soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils are suited to windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for urban uses. Septic tank absorption fields require special design to compensate for the slow permeability.

Capability subclass IIle, dryland, and IIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

17—Bearpaw-Vida clay loams, 4 to 8 percent slopes. This complex consists of Bearpaw and Vida soils on glaciated uplands. The elevation is 2,600 to

3,800 feet. The average annual precipitation is 15 inches, and the mean annual temperature is 42 degrees F. The average growing season is 110 days.

The Bearpaw soil makes up about 45 percent of this map unit, and the Vida soil makes up 40 percent. Included with these soils in mapping are small areas of Dimmick, Nishon, Elloam, and Zahill soils. These soils make up about 15 percent of the map unit. Dimmick and Nishon soils are nearly level or level. They are in enclosed basins that are subject to ponding. The Elloam soil is in sparsely vegetated small depressions. It is moderately affected by sodium. The Zahill soil is gently rolling on the top of knolls and ridges.

The Bearpaw soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer, where mixed, is dark grayish brown clay loam to a depth of 7 inches. The subsoil is dark grayish brown and grayish brown clay loam 16 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 36 inches. Surface runoff is moderate. Wind and water erosion are a moderate hazard.

The Vida soil is deep and well drained. It formed in glacial till on the upper part of slopes. Typically, the surface layer, where mixed, is dark grayish brown clay loam to a depth of 7 inches. The subsoil is mostly brown clay loam 7 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 34 inches. Surface runoff is medium. Wind and water erosion are a moderate hazard.

The soils of this complex are used for dryland crops, range, and irrigated alfalfa for hay. Dryland crops are mainly wheat and barley.

Wind and water erosion are the main limitations in using these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue help control wind and water erosion.

The soils are suited to use as rangeland. The potential plant community on the Bearpaw and Vida soils consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Some sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and big sagebrush increase; and clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes invade.

The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

The soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils are suited to windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design to compensate for the slow permeability.

Capability subclass IIle, dryland, and IIle, irrigated; Silty range site, 15- to 19-inch precipitation zone.

18—Belain loam, 2 to 8 percent slopes. This is a moderately deep, well drained soil in the Bearpaw Mountains. It formed in material that weathered from hard igneous rock on uplands and mountains. The elevation is 3,000 to 6,000 feet. Slopes are mainly short. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam and gravelly loam 11 inches thick. The substratum is brown gravelly loam and very gravelly loam 13 inches thick. Igneous bedrock is at a depth of 28 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 28 inches. Surface runoff is medium. Wind and water erosion are a moderate hazard. The depth to hard igneous bedrock ranges from 20 to 40 inches.

Small areas of Castner and Hedoes soils are included with this soil in mapping. The Castner soil is shallow, moderately sloping, and on ridges.

The Belain soil is used mainly as rangeland, but in some areas it is used for dryland crops, mainly wheat and barley, or for irrigated crops. The main irrigated crop is alfalfa hay.

Droughtiness and wind and water erosion are the main limitations to using this soil for cultivated crops. Because of droughtiness, successful crop production depends on good distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall grass barriers for trapping windblown snow help to conserve moisture. Stripcropping, tall grass barriers, minimum tillage, and stubble mulch tillage help control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Some sedges, woody plants, and forbs are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease; Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase; and clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes invade.

The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil is suited to windbreaks. The low available water capacity of the soil, however, restricts the choice of trees and shrubs to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and western sandcherry.

Because of the hard igneous rock at a depth of 20 to 40 inches, this soil is limited for most urban uses. The hard bedrock imposes a serious limitation to the construction of houses with basements and to the design of sewage disposal systems.

Capability subclass IIle, dryland, and IIle, irrigated; Silty range site, 15- to 19-inch precipitation zone.

19—Benz loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil. It formed in alluvium on fans and terraces in valleys and on uplands. The elevation is 2,300 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is grayish brown loam 3 inches thick. The substratum in the upper 10 inches is grayish brown loam. Below that, to a depth of 60 inches, it is mostly grayish brown loam and clay loam stratified with thin lenses of fine sandy loam.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil in those areas that are in native vegetation is 25 inches. Surface runoff is medium. Erosion by wind and water is a moderate hazard. This soil is strongly affected by sodium and is subject to surface crusting.

Small areas of Havre, Vanda, and Yamac soils are included with this soil in mapping.

The Benz soil is very poorly suited to cultivated crops because it is strongly affected by sodium. It is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, needleandthread, prairie junegrass, Sandberg bluegrass, inland saltgrass, Nuttall saltbush, and greasewood. Some forbs are decreasers. If the rangeland is overgrazed, western wheatgrass and Nuttall saltbush decrease; forbs, needleandthread, prairie junegrass, and inland saltgrass increase; and broom snakeweed, foxtail barley, and annual grasses invade.

The potential plant community produces 400 pounds of forage per acre in favorable years and 200 pounds per acre in unfavorable years.

This soil is not suited to windbreaks because it is strongly affected by sodium.

The slow permeability limits the use of this soil for most urban uses. Septic tank absorption fields require special design to overcome the limitations imposed by the slow permeability.

Capability subclass VIs, dryland; Saline Upland range site, 10- to 14-inch precipitation zone.

20—Bowdoin clay. This is a deep, moderately well drained, nearly level soil. It formed in alluvium on flood plains and terraces in valleys. The elevation is 2,300 to 2,500 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is gray clay 6 inches thick. The substratum in the upper 28 inches is gray clay, and below that, to a depth of 60 inches or more, it is grayish brown clay.

Permeability is very slow, and because the soil is affected by sodium the available water capacity is moderate. The root zone extends to a depth of about 60 inches. The average annual wetting depth of the soil where it is in native vegetation is 30 inches. Surface runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. The soil is subject to rare flooding.

Small areas of Harlem and Vanda soils are included with this soil in mapping.

Because it is clayey and strongly affected by sodium, this soil is very poorly suited to cultivation. It is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, and Nuttall saltbush decrease; prairie junegrass, silver sagebrush, Sandberg bluegrass, and inland saltgrass increase; and foxtail barley, curlycup gumweed, plains pricklypear, and broom snakeweed invade.

The potential plant community produces 800 pounds of forage per acre in favorable years and 300 pounds per acre in unfavorable years.

This soil is not suited to windbreaks because it is strongly affected by sodium.

This soil is subject to rare flooding, which imposes a very serious limitation for urban uses.

Capability subclass VIs, dryland; Dense Clay range site, 10- to 14-inch precipitation zone.

21—Cabba loam, 8 to 35 percent slopes. This is a shallow, well drained, strongly sloping to steep soil that formed in soft siltstone on uplands. The elevation ranges from 3,200 to 4,000 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the mean annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer is grayish brown loam 3 inches thick. The substratum is mostly olive loam in the upper 9 inches. Below that, to a depth of 60 inches, it is soft platy siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 12 inches. The average annual wetting depth of the soil where it is in native vegetation is 12 inches. Surface runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Soft sedimentary beds are at a depth of 10 to 20 inches. This soil is droughty.

Small areas of sandstone and shale outcrop and areas of Farnuf soil are included with this soil in mapping. Sandstone outcrop and shale outcrop are on knolls and steep slopes. The Farnuf soil is on fans and foot slopes. It is moderately sloping.

The Cabba soil is very poorly suited to cultivated crops because the available water capacity is very low, platy siltstone is at a depth of 10 to 20 inches, and water erosion is a severe hazard. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, Idaho fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Some sedges, woody plants, and forbs are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase; and clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes invade.

The potential plant community produces 1,200 pounds of forage per acre in favorable years and 700 per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can

enter the soil. Clubmoss can be removed effectively by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is not suited to windbreaks because of its very low available water capacity and the shallowness to platy siltstone.

The platy siltstone and the slope are the main limitations to most urban uses.

Capability subclass VIs, dryland; Shallow range site, 15- to 19-inch precipitation zone.

22—Cabba-Rock outcrop complex, 25 to 75 percent slopes. This complex consists of steep Cabba soil and steep and very steep Rock outcrop on uplands. The elevation is 3,200 to 4,000 feet. The average annual precipitation is 14 inches, and the mean annual temperature is 43 degrees F. The average growing season is 110 days.

The Cabba soil makes up about 55 percent of the map unit, and Rock outcrop makes up 30 percent. Included in mapping are small areas of Castner, Farnuf, and Perma soils. These soils make up about 15 percent of the map unit.

The Cabba soil is shallow and well drained. It formed on the sides of hills and ridges in material that weathered from soft siltstone. Typically, the surface layer is grayish brown loam 3 inches thick. The substratum is mostly olive loam in the upper 9 inches. Below that, to a depth of 60 inches, it is soft platy siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is 12 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 12 inches. Surface runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. Platy siltstone is at a depth of 10 to 20 inches.

Rock outcrop consists of ledges on hillsides and rims along ridgetops.

This complex is not suited to cultivated crops because of the steep and very steep slopes, the rock outcrop, and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This complex is suited to use as rangeland, although the steep and very steep slopes make grazing difficult for livestock. The potential plant community on the Cabba soil consists mainly of bluebunch wheatgrass, rough fescue, little bluestem, green needlegrass, Idaho fescue, and needleandthread. Forbs and woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass and rough fescue decrease, prairie junegrass, needleandthread, blue grama, and fringed sagewort increase, and annual grasses, broom snakeweed, and pussytoes invade. In some places, there are a few ponderosa pine and limber pine trees.

The potential plant community of the Cabba soil produces 1,200 pounds of forage per acre in favorable years and 700 pounds per acre in unfavorable years.

This complex is not suited to windbreaks because of the steep and very steep slopes.

The slopes and the rock outcrop are the main limitations to most urban uses.

Capability subclass VIIe, dryland. Cabba soil is in Shallow range site, 15- to 19-inch precipitation zone.

23—Cabba-Windham association, steep. This association consists of Cabba soil below the edge of terraces and Windham soil on the edge of outwash terraces on uplands in the southeastern part of the survey area. The elevation ranges from 3,200 to 4,500 feet. The average annual precipitation is 15 inches, and the mean annual temperature is 42 degrees F. The average growing season is 110 days.

The Cabba soil makes up about 55 percent of the map unit, and the Windham soil makes up 30 percent. Included in mapping, and making up about 15 percent of the map unit, are small areas of Judith, Farnuf, and Martinsdale soils and some areas of shale outcrop. The Judith, Farnuf, and Martinsdale soils are moderately sloping. The shale outcrop is along eroded drainageways; the slopes are steep or very steep.

The Cabba soil is shallow and well drained. It formed in material that weathered from soft siltstone. Typically, the surface layer is grayish brown loam 3 inches thick. The substratum is mostly olive loam in the upper 9 inches. Below that, to a depth of 60 inches, it is soft platy siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The root zone extends to a depth of 12 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 12 inches. Surface runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Soft sedimentary beds are at a depth ranging from 10 to 20 inches.

The Windham soil is deep and well drained. It formed in alluvium. Typically, the surface layer is dark grayish brown gravelly loam 6 inches thick. The substratum, to a depth of 60 inches, is pale brown very gravelly loam.

Permeability is moderate, and the available water capacity is low. The root zone extends to a depth of about 60 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 30 inches. Surface runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. This soil is droughty because of the large number of rock fragments in the profile.

The soils in this association are not suited to cultivated crops because of the steep slopes, droughtiness, and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

The soils are suited to use as rangeland. The potential plant community on the Cabba soil consists mainly of

bluebunch wheatgrass, rough fescue, green needlegrass, and needleandthread. Forbs and woody plants are decreasers. The potential plant community on the Windham soil consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass and rough fescue decrease, needleandthread, blue grama, fringed sagewort, prairie junegrass, and threadleaf sedge increase, and clubmoss, annual grasses, Hood phlox, pussytoes, and broom snakeweed invade. The potential plant community of the Cabba soil produces 1,200 pounds of forage per acre in favorable years and 700 pounds per acre in unfavorable years. The potential plant community of the Windham soil produces 1,500 pounds of forage per acre in favorable years and 900 pounds per acre in unfavorable years.

Clubmoss is very competitive. Its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this association are not suited to windbreaks because of the steep slopes.

The steep slopes limit the soils for urban uses.

Capability subclass VIe, dryland. Cabba soil is in Shallow range site, 15- to 19-inch precipitation zone; Windham soil is in Thin Hilly range site, 15- to 19-inch precipitation zone.

24—Cabba-Zahill association, steep. This association consists of Cabba and Zahill soils on uplands. The elevation ranges from 3,200 to 4,000 feet. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Cabba soil makes up 50 percent of the map unit, and the Zahill soil makes up 35 percent. Included in mapping, and making up about 15 percent of the map unit, are small areas of shale outcrop and of Vida and Farnuf soils. The areas of shale outcrop are along drainageways and on the lower part of slopes. The areas are eroded.

The Cabba soil is shallow and well drained. It is on the lower part of slopes and formed in material that weathered from soft siltstone. Typically, the surface layer is grayish brown loam 3 inches thick. The substratum is olive loam in the upper 9 inches. Below that, to a depth of 60 inches, it is soft platy siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is 12 inches. The average annual wetting depth of the soil where it is under native vegetation is 12 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. Soft sedimentary beds are at a depth of 10 to 20 inches.

The Zahill soil is deep and well drained. It formed in glacial till on the upper part of slopes. Typically, the surface layer, if mixed to a depth of 7 inches, is grayish brown clay loam. The substratum, to a depth of 60 inches or more, is grayish brown clay loam.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil where it is under native vegetation is 36 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The soils in this association are not suited to cultivated crops because of the steep slopes and the severe hazard of water erosion. Furthermore, the Cabba soil is shallow to bedrock. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

The soils in this association are suited to use as rangeland and are used as rangeland. The potential plant community on the Cabba soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and needleandthread. Forbs and some woody plants are decreasers. The potential plant community on the Zahill soil consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. Overgrazing results in a decrease of desirable plants, such as bluebunch wheatgrass and rough fescue, and an increase of needleandthread, blue grama, fringed sagewort, and prairie junegrass. Clubmoss, annual grasses, Hood phlox, pussytoes, and broom snakeweed are likely to invade.

On the Cabba soil, the potential plant community produces 1,200 pounds of forage per acre in favorable years and 700 pounds per acre in unfavorable years. On the Zahill soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

Clubmoss is very competitive. Its potential infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this association are not suited to windbreaks because of the steep slopes.

The steep slopes limit the soils for most urban uses.

Capability subclass VIe, dryland. Cabba soil is in Shallow range site, 15- to 19-inch precipitation zone; Zahill soil is in Thin Hilly range site, 15- to 19-inch precipitation zone.

25—Cabbart-Delpoint loams, 8 to 35 percent slopes. This complex consists of strongly sloping to steep Cabbart soil and strongly sloping Delpoint soil on uplands mainly in the southern part of the survey area. The elevation is 2,300 to 3,800 feet. The average annual

precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Cabbart soil makes up about 55 percent of the map unit, and the Delpoint soil makes up 25 percent. Included with these soils in mapping, and making up about 20 percent of the map unit, are small areas of Riedel, Lisam, Marmarth, and Twilight soils and some areas of sandstone and shale outcrop.

The Cabbart soil is shallow and well drained. It formed in material that weathered from soft platy siltstone. Typically, the surface layer is grayish brown loam 4 inches thick. The substratum is grayish brown loam in the upper 8 inches. Below that, to a depth of 60 inches, it is soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 12 inches. The average annual wetting depth of the soil where it is under native vegetation is 12 inches. Runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth of soft sedimentary bedrock is 10 to 20 inches.

The Delpoint soil is moderately deep and well drained. It formed in material that weathered from soft siltstone. It is on broad ridges and foot slopes. Typically, the surface layer is dark brown loam 4 inches thick. The subsoil is grayish brown and light yellowish brown loam 12 inches thick. The substratum, to a depth of 32 inches, is light brownish gray clay loam. Below that, to a depth of 60 inches, it is soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is moderate. The effective rooting depth is about 32 inches. The average annual wetting depth of the soil in areas where it is in native vegetation is 32 inches. Runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Soft sedimentary beds are at a depth of 20 to 40 inches.

The soils in this complex are not well suited to cultivated crops because of the steep slopes, the shallowness to bedrock, the severe hazard of water erosion, and the very low available water capacity of the Cabbart soil. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

The soils are suited to use as rangeland. Most of the forage is produced on the Delpoint soil.

The potential plant community on the Cabbart soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. The potential plant community on the Delpoint soil consists of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass, western wheatgrass, needleandthread, and green needlegrass decrease; blue

grama, prairie junegrass, and fringed sagewort increase; and needleleaf sedge, broom snakeweed, clubmoss, and annual grasses invade.

On the Cabbart soil, the potential plant community produces 800 pounds of forage per acre in favorable years and 400 pounds per acre in unfavorable years. On the Delpoint soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive. Its potential infestation is an especially serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

The soils are not suited to windbreaks because of the very low available water capacity and the shallowness of the Cabbart soil and because the slopes in most places are more than 15 percent.

The shallowness to the soft sedimentary beds and the slopes limit these soils for most urban uses.

Capability subclass VIe, dryland. Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone; Delpoint soil is in Silty range site, 10- to 14-inch precipitation zone.

26—Cabbart-Hillon association, steep. This association consists of Cabbart and Hillon soils on uplands. The elevation is 2,300 to 3,800 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Cabbart soil makes up about 55 percent of the map unit, and the Hillon soil makes up 30 percent. Included in mapping, and making up about 15 percent of the map unit, are small areas of Yamac and Kevin soils and areas of sandstone and shale outcrop.

The Cabbart soil is shallow and well drained. It is on the lower side slopes of hills. It formed in material that weathered from soft sedimentary beds. Typically, the surface layer is grayish brown loam 4 inches thick. The substratum is grayish brown loam in the upper 8 inches. Below that, to a depth of 60 inches, it is soft siltstone that rubs to loam, silt loam, and clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is 12 inches. The average annual wetting depth of the soil under native vegetation is 12 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. Platy siltstone is at a depth of 10 to 20 inches.

The Hillon soil is deep and well drained. It formed in glacial till and is on upper side slopes and ridges. Typically, the surface layer is brown clay loam 4 inches thick. The substratum, to a depth of 60 inches, is grayish brown clay loam.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 26 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard.

The soils in this association are not suited to cultivated crops because of the steep slopes and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

The soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Hillon soil. The steep slopes make it difficult for livestock to fully utilize the forage.

The potential plant community on the Cabbart soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. The potential plant community on the Hillon soil consists mainly of western wheatgrass, bluebunch wheatgrass, needleandthread, green needlegrass, prairie sandreed, and winterfat. Some forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, needleandthread, and bluebunch wheatgrass decrease, blue grama, threadleaf sedge, prairie junegrass, and fringed sagewort increase and annual grasses, broom snakeweed, and needleleaf sedge invade.

On the Cabbart soil, the potential plant community produces 800 pounds of forage per acre in favorable years and 400 pounds per acre in unfavorable years. On the Hillon soil, forage production is 900 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

The soils are not suited to windbreaks because of the steep slopes.

They are limited for most urban uses also because of the steep slopes.

Capability subclass VIe, dryland. Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone; Hillon soil is in Thin Hilly Range site, 10- to 14-inch precipitation zone.

27—Cabbart-Rock outcrop, shale complex, 25 to 60 percent slopes. This complex consists of steep and very steep Cabbart soils and Rock outcrop, shale. It is on uplands in the southern part of the survey area. The elevation is 2,300 to 3,800 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Cabbart soil makes up about 50 percent of the map unit, and Rock outcrop, shale, makes up about 30 percent. Included in mapping are small areas of Riedel, Delpoint, Lisam, and Twilight soils and outcrops of sandstone. These soils and the sandstone outcrops make up about 20 percent of the map unit.

The Cabbart soil is shallow and well drained. It formed on the upper part of slopes in material that weathered from soft siltstone. Typically, the surface layer is grayish brown loam 4 inches thick. The substratum is grayish brown loam in the upper 8 inches. Below that, to a depth of 60 inches, it is soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is 12 inches. The average annual wetting depth of the soil in areas that are in native vegetation is 12 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth to soft sedimentary beds is 10 to 20 inches.

Rock outcrop, shale, is mainly on the lower part of slopes and along drainageways.

This complex is not suited to cultivated crops because of the steep and very steep slopes, the shale outcrop, and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This complex is suited to use as rangeland and is used as rangeland, although steep and very steep slopes make grazing difficult for livestock. The potential plant community on the Cabbart soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, desirable plants such as prairie sandreed, bluebunch wheatgrass, western wheatgrass, and needleandthread decrease; blue grama, prairie junegrass, and fringed sagewort increase; and annual grasses, foxtail barley, needleleaf sedge, and broom snakeweed invade. In some places there are a few ponderosa pine and limber pine trees.

The potential plant community of the Cabbart soil produces 800 pounds of forage per acre in favorable years and 400 pounds per acre in unfavorable years.

This complex is not suited to windbreaks because of the steep and very steep slopes.

The slopes and the shale outcrop are the main limitations to most urban uses.

Capability subclass VIIe, dryland. Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone.

28—Cabbart-Yamac-Rock outcrop complex, 15 to 70 percent slopes. This complex consists of steep to very steep Cabbart soil, moderately steep Yamac soil, and Rock outcrop. It is on uplands in the southern part of the survey area. The elevation is 2,300 to 3,800 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Cabbart soil makes up about 40 percent of the map unit, the Yamac soil about 25 percent, and Rock outcrop about 25 percent. Included in mapping are small areas of Delpoint, Riedel, and Twilight soils. These soils make up about 10 percent of the map unit. The strongly

rolling or hilly Delpoint, Riedel, and Twilight soils are on broad ridges, hills, and knolls.

The Cabbart soil is shallow and well drained. It formed on the upper part of ridges and hills in material that weathered from soft sedimentary beds. Typically, the surface layer is grayish brown loam 4 inches thick. The substratum is grayish brown loam in the upper 8 inches. Below that, to a depth of 60 inches, it is soft siltstone that rubs to loam, silt loam, and clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is 12 inches. The average annual wetting depth of the soil under native vegetation is 12 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth to soft sedimentary beds is 10 to 20 inches.

The Yamac soil is deep and well drained. It formed in alluvium on foot slopes and fans. Typically, the surface layer is grayish brown loam 4 inches thick. The subsoil is light olive brown loam 7 inches thick. The substratum to a depth of 60 inches is light brownish gray loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard.

Rock outcrop consists of ledges on hillsides and rims along ridgetops.

The soils in this complex are not suited to cultivated crops because of steep slopes and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

These soils are suited to use as rangeland and are used as rangeland. The steep and very steep slopes make grazing difficult for livestock. The potential plant community on the Cabbart soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. The potential plant community on the Yamac soil consists mainly of western wheatgrass, little bluestem, needleandthread, green needlegrass, and prairie sandreed. Some forbs are decreasers. If the rangeland is overgrazed, desirable plants such as bluebunch wheatgrass, western wheatgrass, needleandthread, and green needlegrass decrease, blue grama, threadleaf sedge, prairie junegrass, and fringed sagewort increase, and annual grasses, broom snakeweed, and needleleaf sedge are likely to invade. In places there are a few ponderosa pine and limber pine trees.

On the Cabbart soil, the potential plant community produces 800 pounds of forage per acre in favorable years and 400 pounds per acre in unfavorable years. On the Yamac soil, forage production is 1,100 pounds per acre in favorable years and 700 pounds per acre in unfavorable years.

This complex is not suited to windbreaks because of the slopes.

The slopes also are the main limitation to urban development.

Capability subclass VIIe, dryland. Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone; Yamac soil is in Thin Hilly range site, 10- to 14-inch precipitation zone.

29—Castner gravelly loam, 8 to 35 percent slopes.

This is a shallow, well drained, strongly sloping to steep soil on uplands and mountains. It formed in material that weathered from hard sandstone or igneous rock. The elevation is 3,000 to 6,000 feet. Slopes are mainly long. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

Typically, the surface layer of this soil is dark grayish brown gravelly loam 6 inches thick. The substratum is brown very channery loam 7 inches thick. Below that, to a depth of 60 inches, there is hard sandstone or igneous rock.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 13 inches. The average annual wetting depth of the soil where it is in native vegetation is 13 inches. Runoff is medium. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth to hard bedrock is 10 to 20 inches.

Small areas of Belain and Perma soils and Rock outcrop are included with this soil in mapping.

This soil is not suited to cultivated crops because of shallowness to hard rock, the very low available water capacity, and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of bluebunch wheatgrass, rough fescue, green needlegrass, Idaho fescue, and needleandthread. Some forbs and woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass, rough fescue, and green needlegrass decrease, and Idaho fescue, needleandthread, blue grama, and fringed sagewort increase. Weedy plants likely to invade are annual grasses, broom snakeweed, and pussytoes.

The potential plant community produces 1,200 pounds of forage per acre in favorable years and 700 pounds per acre in unfavorable years.

This soil is not suited to windbreaks because of its very low available water capacity.

Shallowness to hard rock and the slopes are the main limitations to most urban uses.

Capability subclass VIe, dryland; Shallow range site, 15- to 19-inch precipitation zone.

30—Castner-Perma-Rock outcrop complex, 25 to 70 percent slopes. This complex consists of steep to very steep Castner and Perma soils and Rock outcrop on uplands and mountains. The elevation is 3,000 to

6,000 feet. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

The Castner soil makes up about 35 percent of the map unit, the Perma soil makes up 35 percent, and Rock outcrop makes up 20 percent. Included in mapping and making up about 10 percent of the map unit are small areas of Belain and Hedoes soils and talus slopes. Talus slopes are very steep slopes in areas below the rock outcrops.

The Castner soil is shallow and well drained. It formed in material that weathered from hard sandstone or igneous bedrock. Typically, the surface layer is dark grayish brown gravelly loam 6 inches thick. The substratum is brown very channery loam 7 inches thick. Below that, to a depth of 60 inches, there is hard rock.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 13 inches. The average annual wetting depth of the soil under native vegetation is 13 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. Bedrock is at a depth of 10 to 20 inches.

The Perma soil is deep and well drained. It formed on the lower part of slopes in colluvium and alluvium derived from igneous rock and hard sandstone. Typically, the surface layer consists of 5 inches of very dark grayish brown gravelly loam and 6 inches of dark grayish brown very gravelly loam. The subsoil is brown very gravelly loam 29 inches thick. The substratum, to a depth of 60 inches, is grayish brown very gravelly loam.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard.

Rock outcrop is on the top of ridges, hills, and mountains.

This complex is not suited to cultivated crops because of the steep and very steep slopes. It is suited to use as rangeland, although the slopes make grazing difficult for livestock. The potential plant community on the Castner soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, and needleandthread. Some forbs and woody plants are decreasers. The potential plant community on the Perma soil consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and little bluestem decrease; Idaho fescue, Woods rose, common snowberry, common chokecherry, needleandthread, blue grama, prairie junegrass, and fringed sagewort increase; and annual grasses, Kentucky bluegrass, broom snakeweed, and pussytoes invade.

On the Castner soil, the potential plant community produces 1,200 pounds of forage per acre in favorable

years and 700 pounds per acre in unfavorable years. On the Perma soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The soils are very poorly suited to timber production. There are, however, a few ponderosa pine and Douglas-fir trees of merchantable quality on north-facing slopes.

The soils in this complex are not suited to windbreaks because of the steep and very steep slopes.

The slopes are the main limitation to most urban uses.

Capability subclass VIIe, dryland. Castner soil is in Shallow range site, 15- to 19-inch precipitation zone; Perma soil is in Thin Hilly range site, 15- to 19-inch precipitation zone.

31—Chinook fine sandy loam, 2 to 6 percent slopes. This is a deep, well drained, undulating to gently rolling soil on glaciated uplands. It formed in alluvial and eolian material. The elevation is 2,500 to 3,500 feet. Slopes are mainly short. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown fine sandy loam 6 inches thick. The subsoil is brown fine sandy loam 10 inches thick. The substratum, to a depth of 60 inches or more, is mostly grayish brown fine sandy loam.

Permeability is moderately rapid, and the available water capacity is moderate or high. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a severe hazard.

Small areas of Elloam and Kevin soils are included with this soil in mapping. The sodium-affected Elloam soil is in small depressions.

The Chinook soil is used mainly as rangeland. In some small areas it is used for dryland crops, mainly wheat, barley, and oats.

The hazard of wind erosion limits the use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or natural vegetation also helps to control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, needleandthread, and western wheatgrass. Some forbs are decreasers. If the rangeland is overgrazed, Indian ricegrass, prairie sandreed, and western wheatgrass decrease, needleandthread, blue grama, and fringed sagewort increase, and annual grasses and plains pricklypear invade.

The potential plant community produces 1,600 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses.

Capability subclass IVe, dryland; Sandy range site, 10- to 14-inch precipitation zone.

32—Chinook fine sandy loam, 6 to 12 percent slopes. This is a deep, well drained, gently rolling to strongly rolling soil. It formed in alluvial and eolian material on glaciated uplands. The elevation is 2,500 to 3,500 feet. Slopes are mainly short. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown fine sandy loam 6 inches thick. The subsoil is brown fine sandy loam 10 inches thick. The substratum, to a depth of 60 inches or more, is mostly grayish brown fine sandy loam.

Permeability is moderately rapid, and the available water capacity is moderate or high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a severe hazard.

Small areas of Elloam and Kevin soils are included with this soil in mapping. The sodium-affected Elloam soil is in sparsely vegetated small depressions.

The Chinook soil is used mainly as rangeland. In some small areas it is used for dryland crops, mainly wheat, barley, and oats.

The hazard of wind erosion limits the use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that uses crop residue can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or natural vegetation also helps to control wind erosion.

This soil is well suited to use as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, needleandthread, and western wheatgrass. Some forbs are decreasers. If the rangeland is overgrazed, Indian ricegrass, prairie sandreed, and western wheatgrass decrease; needleandthread, blue grama, and fringed sagewort increase; and annual grasses and plains pricklypear invade.

The potential plant community produces 1,600 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses.

Capability subclass IVe, dryland; Sandy range site, 10- to 14-inch precipitation zone.

33—Chinook-Phillips complex, 2 to 6 percent slopes. This complex consists of undulating to gently rolling Chinook and Phillips soils on glaciated uplands. The elevation is 2,500 to 3,500 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Chinook soil makes up about 50 percent of this map unit, and the Phillips soil makes up 30 percent. Included with these soils in mapping are small areas of Lihen, Elloam, and Thoeny soils. These soils make up about 20 percent of the map unit. The undulating and gently rolling Lihen soil is on the top of ridges and knolls. The sodium-affected Elloam and the Thoeny soils are in depressions.

The Chinook soil is deep and well drained. It formed in alluvium and eolian material on knolls and ridges.

Typically, the surface layer is grayish brown fine sandy loam 6 inches thick. The subsoil is brown fine sandy loam 10 inches thick. The substratum, to a depth of 60 inches, is mostly grayish brown fine sandy loam.

Permeability is moderately rapid, and the available water capacity is moderate or high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a severe hazard.

The Phillips soil is deep and well drained. It formed in glacial till on uplands. Typically, the surface layer is brown loam 2 inches thick. The subsurface layer is mostly light brownish gray loam 5 inches thick. The upper part of the subsoil is brown clay 3 inches thick. The lower part is mostly grayish brown clay loam 12 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow. The available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The soils in this complex are used mainly as rangeland. In some small areas they are used for dryland crops, mainly wheat, barley, and oats.

Wind and water erosion limit the use of these soils for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind and water erosion. A permanent and adequately maintained cover

of planted grasses or natural vegetation also helps to control wind and water erosion.

The soils in this complex are well suited to use as rangeland and are used as rangeland. The potential plant community on the Chinook soil consists mainly of Indian ricegrass, prairie sandreed, green needlegrass, needleandthread, and western wheatgrass. Some forbs are decreasers. The potential plant community on the Phillips soil consists mainly of western wheatgrass, prairie junegrass, Sandberg bluegrass, prairie sandreed, and Nuttall saltbush. Some woody plants are decreasers. If the rangeland is overgrazed, Indian ricegrass, prairie sandreed, western wheatgrass, and green needlegrass decrease; needleandthread, blue grama, and fringed sagewort increase; and annual grasses, clubmoss, broom snakeweed, and plains pricklypear invade.

On the Chinook soil, the potential plant community produces 1,600 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Phillips soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils can be used for windbreaks. On the Chinook soil, suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry. On the Phillips soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry.

Slow permeability limits the Phillips soil for most urban uses. Septic tank absorption fields on this soil require special design because of the slow permeability. The Chinook soil is suited to most urban uses.

Capability subclass IVe, dryland. Chinook soil is in Sandy range site, 10- to 14-inch precipitation zone; Phillips soil is in Silty range site, 10- to 14-inch precipitation zone.

34—Cozberg fine sandy loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil that formed in alluvial and eolian material on glaciated uplands. The elevation is 2,500 to 3,500 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is brown fine sandy loam 7 inches thick. The subsoil is brown fine sandy loam 19 inches thick. The substratum, to a depth of 60 inches, is mostly pale brown loamy sand.

Permeability is moderately rapid to a depth of about 26 inches and is rapid below that. The available water capacity is moderate. The effective rooting depth is about 30 inches. The average annual wetting depth of this soil where it is in native vegetation is about 36 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard. This soil is droughty.

Small areas of Assinniboine, Chinook, and Wabek soils are included in mapping. The gently sloping Wabek soil is on mounds.

The Cozberg soil is used mainly as rangeland. In some small areas it is used for dryland crops, mainly wheat, barley, and oats.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps to control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, needleandthread, and western wheatgrass. Some forbs are decreasers. If there is continued excessive grazing, desirable plants such as Indian ricegrass and prairie sandreed decrease and needleandthread, blue grama, and fringed sagewort increase. Weedy plants, including annual grasses, are likely to invade.

The potential plant community produces 1,600 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses. Because of the rapid permeability of the substratum, underground water supplies can be polluted by liquid and solid waste from disposal systems.

Capability subclass IVe, dryland; Sandy range site, 10- to 14-inch precipitation zone.

35—Creed loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to undulating soil that formed in alluvium on fans and terraces on uplands. The elevation is 2,400 and 3,800 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is light brownish gray and light gray loam 6 inches thick. The upper part of the subsoil is grayish brown silty clay loam 6 inches thick. The lower part is light brownish gray silty clay loam 4 inches thick. The substratum, to a depth of 60 inches, is light brownish gray silty clay loam in the upper part and light brownish gray and light yellowish brown silty clay loam in the lower part. It has thin strata of loam in the lower part.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The subsoil is slightly affected by sodium at a depth of about 6 inches. It is very hard when dry, impeding the penetration of roots and moisture.

Small areas of Gerdrum, Nobe, and Ethridge soils are included with this soil in mapping. The Gerdrum soil is nearly level and is moderately affected by sodium. It is in small depressions. The Nobe soil is nearly level and gently sloping and is strongly affected by sodium. It is in barren or nearly barren shallow depressions.

This soil is used mainly as rangeland. In some areas it is used for dryland crops, including wheat, oats, and barley, but yields are low because the soil is slightly affected by sodium. Wind erosion is also a limitation. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Some forbs are decreasers. Continued excessive grazing results in a decrease of western wheatgrass and green needlegrass and an increase of needleandthread, blue grama, and fringed sagewort. Furthermore, annual grasses, broom snakeweed, and clubmoss are likely to invade.

The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Because this soil is slightly affected by sodium, the choice of shrubs and trees is restricted to those that are resistant to sodium salts. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

Slow permeability limits this soil for most urban uses. Septic tank absorption fields on this soil require special design because of the slow permeability.

Capability subclass IVs, dryland; Silty range site, 10- to 14-inch precipitation zone.

36—Creed-Gerdrum complex, 0 to 4 percent

slopes. This complex consists of nearly level to gently sloping Creed and Gerdrum soils on fans and terraces on uplands. The soils formed in alluvium. The elevation is 2,400 to 3,800 feet. The average annual precipitation is 12 inches, and the mean annual temperature is 43 degrees F. The average growing season is 115 days.

The Creed soil makes up about 60 percent of the map unit, and the Gerdrum soil makes up 30 percent.

Included with these soils in mapping are small areas of Benz, Ethridge, Marvan, and Nobe soils. These soils make up about 10 percent of the map unit. Benz and Nobe soils are strongly affected by sodium.

The Creed soil is deep and well drained. Typically, the surface layer is light brownish gray and light gray loam 6 inches thick. The upper part of the subsoil is mostly grayish brown silty clay loam 6 inches thick. The lower part is light brownish gray silty clay loam 4 inches thick. The substratum, to a depth of 60 inches or more, is light brownish gray silty clay loam in the upper part and light brownish gray and light yellowish brown silty clay loam in the lower part. It has thin strata of loam in the lower part.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil is slightly affected by sodium at a depth of about 6 inches. It is very hard when dry, and it impedes the penetration of roots and moisture.

The Gerdrum soil is deep and well drained. It formed in alluvium in sparsely vegetated small depressions. Typically, the surface layer, where mixed, is grayish brown clay loam 7 inches thick. The upper part of the subsoil is mostly grayish brown clay 15 inches thick. The lower part is light brownish gray clay loam 14 inches thick. The substratum to a depth of 60 inches is grayish brown sandy clay loam and brown gravelly sandy loam.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil is moderately affected by sodium. If this soil is cultivated, the subsoil becomes very hard when dry, and it restricts the movement of roots and moisture. In cultivation, the surface layer and upper part of the subsoil are mixed, and the crusting that results reduces seedling emergence and crop yields.

The soils in this complex are used mainly as rangeland. In some small areas they are used for dryland crops, mainly wheat, barley, and oats. Wind erosion and

surface crusting are the main limitations to use of the soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. Applications of manure or other organic matter help reduce surface crusting and increase crop yields.

The soils in this complex are suited to use as rangeland. Most of the forage is produced by the Creed soil. The potential plant community on the Creed soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Some forbs are decreasers. The potential plant community on the Gerdrum soil consists of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. Some forbs are decreasers. Continued excessive grazing results in a decrease of desirable plants, including western wheatgrass, green needlegrass, and Nuttall saltbush, and an increase of needleandthread, blue grama, fringed sagewort, prairie junegrass, and shrubby cinquefoil. Furthermore, weedy plants, including annual grasses, broom snakeweed, plains pricklypear, and clubmoss, are likely to invade.

On the Creed soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Gerdrum soil, forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. Because the soils are affected by sodium, the choice of shrubs and trees is restricted to those that are resistant to sodium. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

Slow permeability limits the soils for most urban uses. Septic tank absorption fields on these soils require special design because of the slow permeability. The Gerdrum soil has low strength and high shrink-swell potential. Consequently, basements and foundations for buildings on this soil require special design.

Capability subclass IVs, dryland. Creed soil is in Silty range site, 10- to 14-inch precipitation zone; Gerdrum soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

37—Delpoint loam, 2 to 4 percent slopes. This is a moderately deep, well drained soil on uplands. It formed

in material that weathered from soft siltstone. The elevation is 2,300 to 3,800 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is dark brown loam 4 inches thick. The upper part of the subsoil is grayish brown loam 4 inches thick, and the lower part is light yellowish brown loam 8 inches thick. The substratum is light brownish gray clay loam 16 inches thick, and below that, to a depth of 60 inches, it is soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is moderate. The effective rooting depth is about 32 inches. The average annual wetting depth of the soil under native vegetation is 32 inches. Runoff is slow. Wind erosion is a moderate hazard. The depth to soft siltstone ranges from 20 to 40 inches.

Small areas of Cabbart, Riedel, and Twilight soils are included with this soil in mapping. The moderately sloping, shallow Cabbart soils and the moderately deep Riedel soils are on knolls. The gently sloping Twilight soils are on the lower part of slopes.

This Delpoint soil is used mainly as rangeland. In some areas it is used for dryland crops, mainly wheat, barley, and oats. Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can help control wind erosion. A permanent and adequately maintained cover of planted grasses or natural vegetation also helps to control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Some forbs are decreasers. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease; prairie junegrass, needleandthread, blue grama, threadleaf sedge, and fringed sagewort increase; and annual grasses, clubmoss, and broom snakeweed invade.

The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks, but the moderate available water capacity and the siltstone beds restrict the choice of shrubs and trees. Suitable trees include Russian-olive, Siberian crabapple, green ash,

Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

Because of the 20- to 40-inch depth to soft sedimentary bedrock, this soil is limited for most urban uses. Septic tank absorption fields require special design.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

38—Delpoint-Cabbart loams, 2 to 8 percent slopes.

This complex consists of undulating to gently rolling Delpoint and Cabbart soils on uplands. The elevation is 2,300 to 3,800 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Delpoint soil makes up about 45 percent of the map unit, and the Cabbart soil makes up 35 percent. Included in mapping are small areas of Riedel, Marmarth, and Twilight soils. These soils make up about 20 percent of the map unit. The Riedel soil is on the top of knolls and ridges. It is undulating to gently rolling. Marmarth and Twilight soils are on lower slopes. They are undulating.

The Delpoint soil is moderately deep and well drained. It formed on the lower part of slopes in material that weathered from soft siltstone. Typically, the surface layer is dark brown loam 4 inches thick. The upper part of the subsoil is grayish brown loam 4 inches thick. The lower part is light yellowish brown loam 8 inches thick. The substratum is light brownish gray clay loam, 16 inches thick, and below that, to a depth of 60 inches, soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is moderate. The effective rooting depth is about 32 inches. The average annual wetting depth of the soil under native vegetation is 32 inches. Runoff is medium. Wind and water erosion are moderate hazards. The depth to soft siltstone ranges from 20 to 40 inches.

The Cabbart soil is shallow and well drained. It formed in material that weathered from soft siltstone. Typically, the surface layer is grayish brown loam 4 inches thick. The substratum is grayish brown loam 8 inches thick, and, below that, to a depth of 60 inches, there is soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 12 inches. The average annual wetting depth of the soil under native vegetation is 12 inches. Runoff is medium. Wind and water erosion are moderate hazards. The depth to soft siltstone ranges from 10 to 20 inches.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops, mainly wheat, barley, and oats. Wind and water erosion are the main limitations to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop

residue, contour stripcropping, and grassed waterways help control wind erosion.

These soils are suited to use as rangeland. Most of the forage is produced on the Delpoint soil. The potential plant community on the Delpoint soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Some forbs are decreasers. The potential plant community on the Cabbart soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Some forbs and woody plants are decreasers. If there is continued excessive grazing, the desirable plants such as green needlegrass, western wheatgrass, bluebunch wheatgrass, and needleandthread decrease; and blue grama, threadleaf sedge, fringed sagewort, and prairie junegrass increase; and annual grasses, broom snakeweed, and other weedy plants are likely to invade.

On the Delpoint soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Cabbart soil, forage production is 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks, but the choice of shrubs and trees is restricted. Suitable trees on the Delpoint soil include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry. Suitable trees on the Cabbart soil include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The soft sedimentary beds at a depth of 10 to 20 inches in the Cabbart soil and 20 to 40 inches in the Delpoint soil are limitations for most urban uses. Basements and foundations and septic tank absorption fields on these soils require special design.

Capability subclass IVe, dryland. Delpoint soil is in Silty range site, 10- to 14-inch precipitation zone; Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone.

39—Dimmick clay. This is a deep, very poorly drained, nearly level soil. It formed in clayey alluvium in undrained basins on glaciated uplands. The elevation is 2,500 to 3,800 feet. Slopes are 0 to 1 percent and are mainly medium in length. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is gray clay 22 inches thick. It is overlain by a layer of partly decomposed plant litter. The substratum, to a depth of 60 inches, is gray clay.

Permeability is very slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 60 inches. Runoff is very slow. Wind and water erosion are slight hazards. This soil is subject to frequent flooding in spring. The water table is within 3 feet of the surface in winter and in spring.

Small areas of Nishon soil are included with this soil in mapping.

The Dimmick soil is used mainly as rangeland. Ponding during the growing season makes this soil unsuited to cultivated crops.

This soil is suited to use as rangeland. The potential plant community consists mainly of prairie cordgrass, tall reedgrass, tufted hairgrass, and tall sedges. Forbs, sedges, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as prairie cordgrass, tall reedgrass, and tufted hairgrass and an increase of Baltic rush, forbs, woody plants, foxtail barley, and Rocky Mountain iris. The potential plant community produces 5,000 pounds of forage per acre in favorable years and 3,000 pounds per acre in unfavorable years.

This soil is not suitable for windbreaks because it is very poorly drained.

Wetness and flooding limit this soil for most urban uses.

Capability subclass Vw, dryland; Wetland range site, 10- to 14-inch precipitation zone.

40—Elloam clay loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil on uplands. It formed in glacial till. The elevation is 2,300 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil, if mixed to a depth of 7 inches, is light brownish gray clay loam. The subsoil is grayish brown clay loam 10 inches thick. The substratum is grayish brown and olive clay loam to a depth of 60 inches.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil is moderately affected by sodium. This soil is subject to surface crusting, which reduces seedling emergence and crop yields.

Small areas of Thoeny, Nobe, and Phillips soils are included with this soil in mapping. The Thoeny soil is at the head of drainageways and in vegetated depressions. The Nobe soil, which is strongly affected by sodium, is in depressions.

The Elloam soil is used mainly as rangeland. In a few small areas it is used for dryland crops, mainly wheat,

barley, and oats. Wind erosion and surface crusting are the main limitations to use of this soil for cultivated crops. Applications of manure or other organic matter reduce surface crusting and increase crop yields. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, forbs, and greasewood. If there is continued excessive grazing, desirable plants such as western wheatgrass, green needlegrass, and Nuttall saltbush decrease and plants such as prairie junegrass and inland saltgrass increase. Weedy plants likely to invade are foxtail barley, curlycup gumweed, plains pricklypear, broom snakeweed, and clubmoss. The potential plant community produces 800 pounds of forage per acre in favorable years and 300 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Because it is moderately affected by sodium, the choice of shrubs and trees is restricted. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The very slow permeability and low soil strength limit this soil for most urban uses. Septic tank absorption fields require special design because of the very slow permeability. Basements and foundations need special design because of the low strength.

Capability subclass IVs, dryland; Dense Clay range site, 10- to 14-inch precipitation zone.

41—Ethridge silty clay loam, 0 to 4 percent slopes.

This is a deep, well drained, nearly level to gently sloping soil on fans and stream terraces on uplands. It formed in alluvium. The elevation is 2,300 to 3,600 feet. Slopes are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown silty clay loam 6 inches thick. The subsoil is dark brown and grayish brown silty clay 14 inches thick. The substratum, to a depth of 60 inches, is grayish brown silty clay loam.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under

native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Gerdrum, Vanda, and Marvan soils are included with this soil in mapping. The nearly level Gerdrum and Vanda soils are in shallow, sparsely vegetated depressions. The Gerdrum soil is moderately affected by sodium, and the Vanda soil is strongly affected by sodium. These soils have a subsoil that is very hard when dry. The hard subsoil restricts the penetration of roots and moisture. If these soils are cultivated, the mixing of the surface layer and the upper part of the subsoil causes surface crusting, which reduces seedling emergence and crop yields. Applications of manure or other organic matter reduce surface crusting and increase crop yields.

The Ethridge soil is used mainly for dryland crops and irrigated alfalfa and as rangeland. Dryland crops are mainly wheat, barley, and oats. Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of plants such as needleandthread, blue grama, and fringed sagewort. Weedy plants likely to invade are annual grasses, broom snakeweed, and clubmoss. The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability, shrink-swell potential, and low soil strength limit the soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability. Basements and foundations for buildings require special design because of the shrink-swell potential and low soil strength.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 10- to 14-inch precipitation zone.

42—Ethridge-Gerdrum complex, 0 to 4 percent slopes. This complex consists of nearly level to gently sloping soils on fans and stream terraces on uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Ethridge soil makes up about 60 percent of this map unit, and the Gerdrum soil makes up 25 percent. Included with these soils in mapping are small areas of Nobe, Harlem, and Marvan soils. These soils make up about 15 percent of the map unit. The nearly level or gently sloping Nobe soil is in small barren areas. It is strongly affected by sodium.

The Ethridge soil is deep and well drained. It formed in alluvium in smooth areas. Typically, the surface layer is grayish brown silty clay loam 6 inches thick. The subsoil is dark brown and grayish brown silty clay 14 inches thick. The substratum, to a depth of 60 inches, is grayish brown silty clay loam.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Gerdrum soil is deep and well drained. It formed in alluvium in sparsely vegetated small depressions. Typically, the surface layer, where mixed, is grayish brown clay loam to a depth of 7 inches. The upper part of the subsoil is mostly grayish brown clay 15 inches thick. The lower part is light brownish gray clay loam 14 inches thick. The substratum, to a depth of 60 inches, is grayish brown sandy clay loam and brown gravelly sandy loam.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil is moderately affected by sodium. It is very hard when dry; thus, the movement of roots and moisture is restricted. If this soil is cultivated, the surface layer and the upper part of the subsoil are mixed. This mixing results in surface crusting, which impedes seedling emergence, and thus crop yields are reduced.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops, mainly wheat, barley, and oats.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. On the Gerdrum soil, applications of manure or other organic matter are needed to reduce surface crusting and thus increase crop yields.

This complex is suited to use as rangeland. Most of the forage is produced on the Ethridge soil. The potential

plant community on the Ethridge soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. The potential plant community on the Gerdrum soil consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, forbs, and greasewood. If the rangeland is overgrazed, desirable plants such as western wheatgrass and green needlegrass decrease and needleandthread, blue grama, fringed sagewort, prairie junegrass, and shrubby cinquefoil increase. Annual grasses, clubmoss, broom snakeweed, and plains pricklypear are likely to invade.

On the Ethridge soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds in unfavorable years. On the Gerdrum soil, forage production is 800 pounds per acre in favorable years and 300 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Because the Gerdrum soil is moderately affected by sodium, shrubs and trees are restricted to those that are resistant to sodium salts. Suitable trees on the Ethridge soil include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. On the Gerdrum soil, suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability and low soil strength of the Ethridge soil and the slow permeability, low strength, and high shrink-swell potential of the Gerdrum soil are limitations for most urban uses. Septic tank absorption fields require special design because of the slow permeability. Basements and foundations require special design because of the high shrink-swell potential and low soil strength.

Capability subclass IIIs, dryland. Ethridge soil is in Silty range site, 10- to 14-inch precipitation zone; and Gerdrum soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

43—Farnuf loam, 0 to 2 percent slopes. This is a deep, well drained soil on fans and stream terraces on uplands. It formed in alluvium. The elevation is 2,500 to 4,500 feet. Slopes are mainly short. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is dark grayish brown loam 5 inches thick. The subsoil is mostly dark brown and brown clay loam 19 inches thick. The substratum is pale brown clay loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Martinsdale, Shawmut, and Straw soils are included with this soil in mapping.

This soil is used for dryland and irrigated crops and as rangeland. The main dryland crops are wheat, barley, and oats. The main irrigated crops are wheat, barley, oats, alfalfa for hay, and corn for silage.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds per acre in unfavorable years.

Clubmoss is very competitive and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderate permeability and low soil strength limit this soil for most urban uses. Septic tank absorption fields require special design because of the moderate permeability.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

44—Farnuf loam, 2 to 4 percent slopes. This is a deep, well drained soil on fans and stream terraces on uplands. It formed in alluvium. The elevation is 2,500 to 4,000 feet. Slopes are mainly short. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is dark grayish brown loam 5 inches thick. The subsoil is mostly dark brown and brown clay loam 19 inches thick. The substratum is pale brown clay loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Shawmut, Martinsdale, and Straw soils are included with this soil in mapping.

This soil is used for dryland and irrigated crops and as rangeland. The main dryland crops are wheat, barley, and oats. The main irrigated crops are wheat, barley, oats, alfalfa for hay, and corn for silage.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderate permeability and low soil strength limit this soil for most urban uses. Septic tank absorption fields require special design because of the moderate permeability.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

45—Farnuf loam, 4 to 8 percent slopes. This is a deep, well drained soil on fans and stream terraces on uplands. It formed in alluvium. The elevation is 2,500 to 4,500 feet. Slopes are mainly short. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is dark grayish brown loam 5 inches thick. The subsoil is mostly dark brown and brown clay loam 19 inches thick. The substratum is pale brown clay loam to a depth of 60 inches or more.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

Small areas of Shawmut and Martinsdale soils are included with this soil in mapping.

The Farnuf soil is used for dryland crops, irrigated alfalfa hay, and as rangeland. The main dryland crops are wheat, barley, and oats.

Wind and water erosion are the main limitations to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

The soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderate permeability and low soil strength limit this soil for most urban uses. Septic tank absorption fields require special design because of the moderate permeability.

Capability subclass IIIe, dryland, and IIIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

46—Gerdrum clay loam, 0 to 4 percent slopes. This is a deep, well drained soil on fans and terraces on uplands. It formed in alluvium. The elevation is 2,300 to 3,600 feet. Slopes are mainly short. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer, if mixed to a depth of 7 inches, is grayish brown clay loam. The subsoil, to a depth of 22 inches, is mostly grayish brown clay, and below that, to a depth of 36 inches, it is light brownish gray clay loam. The substratum is grayish brown sandy clay loam and brown gravelly sandy loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is about 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil is moderately affected by sodium. It is very hard when dry and restricts the movement of roots and moisture. When this soil is cultivated, the surface layer and the upper part of the subsoil are mixed, and a crust forms on the surface which reduces seedling emergence and crop yields.

Included with this soil in mapping are small areas of Thoeny and Vanda soils. The Vanda soil is nearly level to gently sloping and is strongly affected by sodium. It is in sparsely vegetated areas.

This soil is used mainly as rangeland. In some small areas it is used for dryland crops. The main dryland crops are wheat and barley.

Wind erosion and surface crusting are the main limitations to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residues can effectively control wind erosion. Applications of manure or other organic matter reduce surface crusting and increase crop yields.

The soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. Forbs are decreaseers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, and Nuttall saltbush decrease; and prairie junegrass,

Sandberg bluegrass, and inland saltgrass increase. Weedy plants likely to invade are foxtail barley, curlycup gumweed, plains pricklypear, and broom snakeweed. The potential plant community produces 800 pounds of forage per acre in favorable years and 300 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

The soil can be used for windbreaks. It is moderately affected by sodium, which limits the choice of shrub and tree species. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability, low soil strength, and high shrink-swell potential limit this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability. Basements and foundations for houses require special design because of the high shrink-swell potential and low soil strength.

Capability subclass IVs, dryland; Dense Clay range site, 10- to 14-inch precipitation zone.

47—Glendive fine sandy loam. This is a deep, well drained, nearly level soil on plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown fine sandy loam 7 inches thick. The substratum is light brownish gray fine sandy loam stratified with thin lenses of loamy sand to loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a severe hazard. The soil is subject to rare flooding.

Small areas of Hanly loamy fine sand and Havre loam are included with this soil in mapping.

The Glendive soil is used for irrigated and dryland crops. The main irrigated crops are alfalfa for hay, wheat, barley, corn for silage, and sugar beets. The main dryland crops are wheat, barley, and oats.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps control wind erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, needleandthread, and western wheatgrass. Forbs and some woody plants are decreaseers. If the rangeland is overgrazed, Indian ricegrass and prairie sandreed

decrease and needleandthread, woody increaseers, blue grama, and fringed sagewort increase. Weedy plants likely to increase are annual grasses, leafy spurge, Russian knapweed, and burdock. The potential plant community produces 1,600 pounds of forage per acre in favorable years and 800 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

Along the Milk River and its tributaries are narrow, uneven-aged stands of plains cottonwood. The timber has little commercial value because of the small amount available.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IIle, dryland, and IIe, irrigated; Sandy range site, 10- to 14-inch precipitation zone.

48—Hanly loamy fine sand. This is a deep, well drained, nearly level and undulating soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown loamy fine sand 3 inches thick. The substratum, to a depth of 60 inches or more, is light brownish gray loamy fine sand stratified with thin lenses of sand and fine sandy loam.

Permeability is rapid, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard. This soil is droughty. It is subject to occasional flooding in spring.

Included with this soil in mapping are small areas of Glendive fine sandy loam and Havre loam.

This soil is used mainly as rangeland. In some areas it is used for irrigated alfalfa for hay.

Wind erosion and droughtiness are the main limitations to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or natural vegetation also helps control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, and needleandthread. Forbs and some woody plants are decreaseers. If the rangeland is overgrazed, Indian ricegrass and prairie sandreed

decrease and needleandthread, Woods rose, woody increasers, and green sagewort increase. Weedy plants likely to invade are annual grasses, leafy spurge, Russian knapweed, and burdock. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

This soil supports narrow stands of plains cottonwood along the Milk River and its tributaries. Except for local use these trees have little commercial value.

The hazard of flooding limits this soil for most urban uses.

Capability subclass VIw, dryland, and IIIs, irrigated; Sandy range site, 10- to 14-inch precipitation zone.

49—Harlem loam. This is a deep, well drained or moderately well drained, nearly level soil on flood plains and stream terraces. It formed in alluvium. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown loam 10 inches thick. The substratum, to a depth of 60 inches or more, is grayish brown silty clay loam stratified with thin lenses of loam and silt loam.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is subject to rare flooding.

Small areas of Havre silty clay loam, Glendive fine sandy loam, and soils that are moderately affected by salts and sodium are included with this soil in mapping.

This soil is used for dryland and irrigated crops. The main dryland crops are wheat, oats, and barley. The main irrigated crops are alfalfa for hay, wheat, barley, and corn for silage.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

It is important to prevent this soil from becoming affected by sodium and other salts. Proper application of water, proper design of irrigation and drainage systems, and lining irrigation canals help prevent salt and sodium buildup.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease and

needleandthread, blue grama, and fringed sagewort increase. Weedy plants likely to invade are annual grasses, leafy spurge, and Russian knapweed. The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, russet buffaloberry, and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IIIs, dryland, and IIs, irrigated; Silty range site, 10- to 14-inch precipitation zone.

50—Harlem silty clay loam. This is a deep, well drained or moderately well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent and are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown silty clay loam 10 inches thick. The substratum, to a depth of 60 inches or more, is grayish brown silty clay loam stratified with thin lenses of clay loam or silty clay.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil under native vegetation is 36 inches. Runoff is slow. Wind and water erosion is a slight hazard. This soil is subject to rare flooding.

Small areas of Havre loam and Lardell silty clay loam are included with this soil in mapping. Also included are small areas of Harlem silty clay.

This soil is used mainly for irrigated and dryland crops. The main irrigated crops are wheat, barley, and alfalfa for hay. Minor irrigated crops are sugar beets and corn for silage. The main dryland crops are wheat and barley.

It is important to prevent this soil from becoming affected by sodium and other salts. Proper application of water, proper design of irrigation and drainage systems, and lining irrigation canals help prevent salinity.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, Canby bluegrass, Nuttall saltbush, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, green needlegrass, Canby bluegrass, and western wheatgrass decrease and Sandberg bluegrass, prairie junegrass, and fringed sagewort increase. Weedy plants likely to invade are foxtail barley, cheatgrass, and curlycup gumweed. The potential plant community produces 1,300 pounds of

forage per acre in favorable years and 700 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IIIs, dryland, and IIs, irrigated; Clayey range site, 10- to 14-inch precipitation zone.

51—Harlem silty clay loam, saline. This is a deep, moderately well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is olive gray silty clay loam 10 inches thick. The substratum, to a depth of 60 inches, is grayish brown silty clay loam stratified with thin lenses of clay loam and silty clay.

Permeability is slow, and the available water capacity is moderate because of the effect of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind and water erosion is a slight hazard. This soil is moderately affected by salts and sodium. It is subject to rare flooding. The water table is at a depth of 42 to 60 inches in spring and summer.

Small areas of Havre loam and Lardell silty clay loam are included with this soil in mapping. The Lardell soil is strongly affected by sodium.

This soil is used for irrigated crops and as rangeland. The main irrigated crops are alfalfa for hay, wheat, sugar beets, corn for silage, and barley.

This soil can be improved for irrigated crops by leaching as much of the salts and sodium as possible from the upper part of the soil. However, the leaching process is difficult and takes several years because of the slow downward movement of water through the soil. Lowering the level of salts and sodium in the surface layer and applying only enough water to meet crop needs improve yields. Proper use of water also reduces the excessive and detrimental accumulation of salts in the upper part of the soil. Tillage when the soil is too dry or too wet contributes to the formation of large clods that are very difficult to break down.

This soil is suited to use as rangeland. The potential plant community consists mainly of green needlegrass, Nuttall saltbush, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, green needlegrass and

western wheatgrass decrease; and Sandberg bluegrass, blue grama, threadleaf sedge, silver sagebrush, prairie junegrass, and fringed sagewort increase. Weedy plants likely to invade are annual grasses and curlycup gumweed. The potential plant community produces 1,300 pounds of forage per acre in favorable years and 700 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. The choice of shrubs and trees is restricted to those that are resistant to salts and sodium. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IVs, dryland, and IVs, irrigated; Clayey range site, 10- to 14-inch precipitation zone.

52—Harlem silty clay. This is a deep, well drained or moderately well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is olive gray silty clay 10 inches thick. The substratum, to a depth of 60 inches or more, is olive gray silty clay stratified with thin lenses of clay loam to clay.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is about 30 inches. Runoff is slow. Wind and water erosion are slight hazards. This soil is subject to rare flooding.

Included with this soil in mapping are small areas of Lardell silty clay loam, Havre silty clay loam, and Bowdoin clay. The Lardell soil is strongly affected by salts, and the Bowdoin soil is strongly affected by sodium.

This soil is used for irrigated and dryland crops. The main irrigated crops are wheat, barley, alfalfa for hay, corn for silage, and sugar beets. The main dryland crops are wheat and barley.

It is important to prevent this soil from becoming affected by sodium and other salts. Proper application of water, proper design of irrigation and drainage systems, and lining irrigation canals help prevent salinity.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of green needlegrass, western wheatgrass, Nuttall saltbush, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, green needlegrass and western wheatgrass decrease; and Sandberg bluegrass, plains

reedgrass, blue grama, prairie junegrass, and fringed sagewort increase. Weedy plants likely to invade are leafy spurge, annual clubmoss, and Russian knapweed. The potential plant community produces 1,300 pounds of forage per acre in favorable years and 700 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, Rocky Mountain juniper, and Scotch pine. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, silver buffaloberry, and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IIIs, dryland, and IIIs, irrigated; Clayey range site, 10- to 14-inch precipitation zone.

53—Harlem silty clay, saline. This is a deep, moderately well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is olive gray silty clay 6 inches thick. The substratum, to a depth of 60 inches or more, is olive gray silty clay stratified with thin lenses of clay loam to clay.

Permeability is slow, and the available water capacity is moderate because of the effect of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil under native vegetation is 30 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is moderately affected by salts and sodium. This soil is subject to rare flooding. The water table is at a depth of 42 to 60 inches in spring and summer.

Included with this soil in mapping are small areas of Harlem silty clay loam, Lardell silty clay loam, Marvan clay, and Vanda clay. The Lardell soil is strongly affected by salts.

This soil is used mainly for irrigated crops. The main crops are wheat, barley, alfalfa for hay, sugar beets, and corn for silage. In a few small areas this soil is used as rangeland.

The quality of this soil for irrigated crops can be improved by leaching as much of the salts and sodium as possible from the upper part of the soil. However, the leaching process is difficult and takes several years because of the slow downward movement of water through the soil. Lowering the salts and sodium level in the surface layer can improve crop yields.

Application of only enough water to meet crop needs can also improve yields. Proper use of water reduces the excessive and detrimental accumulation of salts and

sodium in the upper part of the soil. Tillage when the soil is too dry or too wet contributes to the formation of large clods that are very difficult to break down.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, and contour stripcropping can effectively control wind erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of green needlegrass, Nuttall saltbush, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, green needlegrass and western wheatgrass decrease and Sandberg bluegrass, blue grama, threadleaf sedge, silver sagebrush, prairie junegrass, and fringed sagewort increase. Weedy plants likely to invade are annual grasses and curlycup gumweed. The potential plant community produces 1,300 pounds of forage per acre in favorable years and 700 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. The choice of shrubs and trees is restricted to those that are resistant to salts and sodium. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, silver buffaloberry, and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IVs, dryland, and IVs, irrigated; Clayey range site, 10- to 14-inch precipitation zone.

54—Harlem Variant-Lardell silty clay loams. This complex consists of nearly level soils on flood plains and stream terraces in valleys. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Harlem Variant makes up about 60 percent of the map unit, and the Lardell soil makes up 30 percent. Included in mapping are small areas of Havre silty clay loam and Harlem silty clay loam. These soils are moderately affected by salts and sodium.

The Harlem Variant is deep and somewhat poorly drained. It is strongly affected by salts and sodium. It formed in alluvium on flood plains and stream terraces. Typically, the surface layer is grayish brown silty clay loam 7 inches thick. Below that, to a depth of 60 inches, the substratum is grayish brown silty clay loam stratified with thin lenses of loam to silty clay. When this soil is dry, few to many fine salt crystals are visible in the surface layer.

Permeability is slow, and the available water capacity is moderate because of the effect of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth where the soil is in native

vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. Flooding is rare. The water table is 2 to 4 feet below the surface in summer.

This soil is wet and is strongly affected by salts and sodium because of the long term use of too much water for irrigation and the excessive losses of water from ditches. The upward movement of water through capillary rise from the seasonal high water table and the subsequent evaporation have brought concentrations of salts to or near the surface. This soil can be improved by leaching as much of the salts and sodium as possible from the upper part of the soil. However, the leaching process is difficult and takes many years because of the slow downward movement of water through the soil.

The Lardell soil is deep and somewhat poorly drained. It is very strongly affected by salts and sodium. It formed in alluvium on flood plains and stream terraces. Typically, the surface layer of this soil is grayish brown silty clay loam 8 inches thick. The substratum, to a depth of 29 inches, is grayish brown silty clay loam; and, to a depth of 60 inches or more, it is light brownish gray loam stratified with thin lenses of fine sandy loam to silty clay loam. When this soil is dry, salt crystals are visible throughout the profile.

Permeability is slow, and the available water capacity is low because of the effects of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. Flooding is rare. The water table is at a depth of 1 to 5 feet in summer.

Reclaiming this soil is slow, difficult, and expensive because of the slow permeability, drainage problems, and the large amount of sodium salts and other salts that are characteristic of this soil.

The soils in this complex are not suited to cultivated crops because of the salts.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Harlem Variant soil. The potential plant community consists mainly of western wheatgrass, alkali sacaton, alkali cordgrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. If the rangeland is overgrazed, desirable plants such as western wheatgrass, alkali sacaton, alkali cordgrass, and Nuttall saltbush decrease, and plants such as Sandberg bluegrass, prairie junegrass, fringed sagewort, and mat muhly increase. Weedy plants likely to invade are foxtail barley, curlycup gumweed, kochia, leafy spurge, cheatgrass, and Russian thistle. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,200 pounds per acre in unfavorable years.

The soils in this complex are not suited to windbreaks because of the effect of the salts.

Although the soils are rarely flooded, flooding is a limitation for most urban uses.

Capability subclass Vlw, irrigated; Saline Lowland range site, 10- to 14-inch precipitation zone.

55—Havre loam. This is a deep, well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown loam 8 inches thick. The substratum, to a depth of 60 inches, is light brownish gray loam stratified with thin lenses of fine sandy loam to clay loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is subject to rare flooding.

Included with this soil in mapping are small areas of Glendive fine sandy loam and Harlem silty clay loam.

This soil is used mainly for dryland and irrigated crops and as rangeland. The main dryland crops are wheat, barley, and oats. The main irrigated crops are wheat, barley, sugar beets, corn silage, and alfalfa for hay.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease and needleandthread, blue grama, and fringed sagewort increase. Weedy plants likely to invade are annual grasses, Russian knapweed, and leafy spurge. The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass Ille, dryland, and Ilc, irrigated; Silty range site, 10- to 14-inch precipitation zone.

56—Havre loam, saline. This is a deep, well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are 0 to 2 percent and are mainly

long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown loam 8 inches thick. The substratum, to a depth of 60 inches or more, is light brownish gray loam stratified with thin lenses of fine sandy loam to clay loam. When the soil is dry, few to many fine salt crystals are visible in the surface layer.

Permeability is moderate, and the available water capacity is moderate because of the effect of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The soil is moderately affected by salts and sodium. This soil is subject to rare flooding. The water table is at a depth of 42 to 60 inches in summer.

Included with this soil in mapping are a few small areas of Lardell silty clay loam that is strongly affected by salts and sodium. Also included are soils that have a fine sandy loam or silty clay loam surface layer and are not affected by salts or sodium.

The Havre soil is used mainly for irrigated cropland, but in small areas it is used as rangeland. The main irrigated crops are wheat, barley, sugar beets, corn for silage, and alfalfa.

The long term use of excess water for irrigation has made this soil moderately affected by salts and sodium. However, the quality of this soil for irrigated crops can be improved by leaching as much of the salts and sodium as possible from the upper part of the soil. Lowering the level of sodium salts and other salts in the surface layer improves crop yields.

Application of only enough water to meet crop needs can also improve yields. Proper use of water reduces the excessive and detrimental accumulation of salts and sodium in the upper part of the soil.

Wind erosion is the main limitation to use of this soil for cultivated crops, but strip cropping, tall grass barriers, field windbreaks, minimum tillage, and tillage which utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of basin wildrye, alkali sacaton, alkali cordgrass, Nuttall alkaligrass, Nuttall saltbush, and silver sagebrush. If the rangeland is overgrazed, basin wildrye, alkali sacaton, alkali cordgrass, and Nuttall saltbush decrease; and western wheatgrass, inland saltgrass, and fringed sagewort increase. Weedy plants likely to invade are foxtail barley, cheatgrass, kochia, Russian knapweed, and leafy spurge. The potential plant community produces 1,800 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks, but droughtiness caused by salts and sodium restricts the choice of

shrubs and trees. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, lilac, American plum, and silver buffaloberry.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IVs, dryland, and IVs, irrigated; Silty range site, 10- to 14-inch precipitation zone.

57—Havre silty clay loam. This is a deep, well drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown silty clay loam 8 inches thick. The substratum, to a depth of 60 inches or more, is light brownish gray loam stratified with thin lenses of fine sandy loam to clay loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is subject to rare flooding.

Included with this soil in mapping are small areas of Harlem silty clay and soils that are moderately and strongly affected by salts.

This soil is used for dryland and irrigated crops. In small areas it is used as rangeland. The main dryland crops are wheat, barley, and oats. The main irrigated crops are alfalfa for hay, wheat, barley, sugar beets, and corn for silage.

Because this soil tends to become affected by salts, it is limited for irrigated crops. Proper application of water, proper design of irrigation and drainage systems, and lining irrigation canals help prevent salt buildup.

Wind erosion is the main limitation to use of this soil for cultivated crops, but strip cropping, tall grass barriers, field windbreaks, minimum tillage, and tillage which utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, Canby bluegrass, Nuttall saltbush, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, Canby bluegrass, green needlegrass, and western wheatgrass decrease and Sandberg bluegrass, prairie junegrass, and fringed sagewort increase. Weedy plants likely to invade are annual grasses and curlycup gumweed. The potential plant community produces 1,300 pounds of forage per acre in favorable years and 700 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white

willow, golden willow, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IIIe, dryland, and IIc, irrigated; Clayey range site, 10- to 14-inch precipitation zone.

58—Havre silty clay loam, saline. This is a deep, well drained, nearly level soil on flood plains and stream terraces. It formed in alluvium. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent and are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown silty clay loam 10 inches thick. The substratum, to a depth of 60 inches, is light brownish gray loam stratified with thin lenses of fine sandy loam to clay loam. When the soil is dry, few to many fine salt crystals are visible in the surface layer.

Permeability is moderately slow, and the available water capacity is moderate because of the effect of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is moderately affected by salts and sodium. It is subject to rare flooding. The water table is at a depth of 42 to 60 inches in summer.

Included with this soil in mapping are small areas of Harlem silty clay and Lardell silty clay loam. The Lardell soil is very strongly affected by salts and sodium.

This soil is used for irrigated crops. In a few small areas it is used as rangeland. The main irrigated crops are alfalfa for hay, wheat, barley, sugar beets, and corn for silage.

This soil can be improved for irrigated crops by leaching as much of the salts and sodium as possible from the upper part of the soil. However, the leaching process is difficult and takes several years because of the slow downward movement of water through the soil. Lowering the level of salts and sodium in the surface layer and applying only enough water to meet crop needs improve yields.

Wind erosion is also a limitation to use of this soil for cultivated crops, but stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of basin wildrye, alkali sacaton, alkali cordgrass, Nuttall saltbush, Nuttall alkaligrass, and silver sagebrush. If the rangeland is overgrazed, basin wildrye, alkali sacaton, alkali cordgrass, and Nuttall saltbush decrease; and western wheatgrass, inland saltgrass, and fringed sagewort increase. Weedy plants likely to invade are

foxtail, barley, cheatgrass, kochia, leafy spurge, Russian knapweed, annual grasses, and curlycup gumweed. The potential plant community produces 1,800 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Because this soil is moderately affected by salts and sodium, the choice of shrubs and trees is restricted. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. When irrigated, this soil is also suitable for Scotch pine and lilac.

Although the soil is rarely flooded, the hazard of flooding limits this soil for most urban uses.

Capability subclass IVs, dryland, and IVs, irrigated; Silty range site, 10- to 14-inch precipitation zone.

59—Havre, Hanly, and Glendive soils, channeled.

This map unit consists of deep, well drained and moderately well drained Havre, Hanly, and Glendive soils on bottom lands and stream terraces. These soils formed in alluvium. The elevation is 2,300 to 3,500 feet. Slopes are 0 to 2 percent. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

These soils are in areas dissected by stream channels, in narrow channeled valleys and drainageways, and on multilevel terraces, low steep knolls, and sides of valleys. They are subject to occasional flooding.

Typically, the surface layer of the Havre soil is grayish brown loam 8 inches thick. The substratum, to a depth of 60 inches or more, is light brownish gray loam stratified with thin lenses of fine sandy loam to clay loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard except where channeling or streambank erosion occurs.

Typically, the surface layer of the Hanly soil is grayish brown loamy fine sand 3 inches thick. The substratum, to a depth of 60 inches, is light brownish gray loamy fine sand stratified with thin lenses of sand and fine sandy loam.

Permeability is rapid, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth under native vegetation is 36 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard, except where channeling or streambank erosion occurs.

Typically, the surface layer of the Glendive soil is grayish brown fine sandy loam 7 inches thick. The

substratum, to a depth of 60 inches or more, is light brownish gray fine sandy loam stratified with thin lenses of loamy sand to loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth under native vegetation is 36 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard except where channeling or streambank erosion occurs.

Included in mapping are small areas of Harlem soils, very gravelly soils, and soils that are wet or wet and saline.

The soils in this map unit are not suited to cultivated crops because the landscape is dissected by stream channels and drainageways.

These soils are suited to use as rangeland and are used as rangeland. The potential plant community consists mainly of basin wildrye, prairie cordgrass, tall sedges, and tufted hairgrass. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, basin wildrye, prairie cordgrass, and tufted hairgrass decrease and western wheatgrass, Baltic rush, and shrubby cinquefoil increase. Weedy plants likely to invade are foxtail barley and Kentucky bluegrass. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

Channels severely limit the use of machinery on these soils in preparing a seedbed and in planting.

The hazard of occasional flooding limits these soils for most urban uses.

Capability subclass VIIw, dryland; Overflow range site, 15- to 19-inch precipitation zone.

60—Havre Variant-Lardell silty clay loams. This complex consists of nearly level soils on flood plains and stream terraces. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Havre Variant makes up about 60 percent of the map unit, and the Lardell soil makes up about 30 percent. Included in mapping, and making up about 10 percent of the unit, are small areas of Harlem silty clay loam and Glendive fine sandy loam. Also included are areas of soils that are slightly affected by salts.

Havre Variant is deep and strongly affected by salts and sodium. It formed in alluvium on flood plains and stream terraces. Typically, the surface layer is grayish brown silty clay loam 7 inches thick. The substratum, to a depth of 60 inches, is grayish brown or light brownish gray loam stratified with thin lenses of fine sandy loam to silty clay loam.

Permeability is moderately slow, and the available water capacity is moderate because of the effect of sodium and other salts. The effective rooting depth is about 60 inches. The average annual wetting depth of

the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is subject to rare flooding. The water table is at a depth of 24 to 48 inches in summer.

This soil is wet and strongly affected by salts and sodium because of the long term use of excess water for irrigation and the excessive losses of water from ditches. The upward movement of water through capillary rise from the seasonally high water table and the subsequent evaporation from the surface have brought concentrations of salts to the surface layer. This soil can be improved by leaching as much of the salts and sodium as possible from the upper part of the soil. However, the leaching process is difficult and takes many years because of the slow downward movement of water through the soil.

The Lardell soil is deep and somewhat poorly drained. It is very strongly affected by salts and sodium. It formed in alluvium on flood plains and stream terraces. Typically, the surface layer is grayish brown silty clay loam 8 inches thick. The substratum, to a depth of 29 inches, is grayish brown silty clay loam, and, to a depth of 60 inches or more, it is light brownish gray loam stratified with thin lenses of fine sandy loam to silty clay loam. When the soil is dry, many fine salt crystals are visible throughout the profile.

Permeability is slow. The available water capacity is low because of the effect of salts and sodium. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. This soil is subject to rare flooding. The water table is at a depth of 12 to 60 inches in summer.

Reclaiming this soil is slow, difficult, and expensive because of the slow permeability, the drainage problem, and the high amount of sodium and other salts that are characteristic of the soil.

The soils in this complex are not suited to cultivated crops because of the salts.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Havre Variant. The potential plant community on Havre Variant consists mainly of western wheatgrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. The potential plant community on the Lardell soil consists mainly of alkali sacaton, Nuttall alkaligrass, Nuttall saltbush, and greasewood. If the rangeland is overgrazed, alkali sacaton and Nuttall saltbush decrease and inland saltgrass, needleandthread, blue grama, fringed sagewort, and mat muhly increase. Weedy plants likely to invade are annual grasses, kochia, Russian thistle, and leafy spurge. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,200 pounds in unfavorable years.

Havre Variant is suitable for seeding of desirable native species and adapted introduced species. Forage

production is increased by complete seedbed preparation and seeding of native species, such as thickspike wheatgrass, slender wheatgrass, and western wheatgrass. The Lardell soil is not suitable for seeding.

The soils in this complex are not suitable for windbreaks because of the salts and sodium.

Although the soils are rarely flooded, the hazard of flooding is a limitation for most urban uses.

Capability subclass Vlw, irrigated; Saline Lowland range site, 10- to 14-inch precipitation zone.

61—Hedoes loam, 2 to 4 percent slopes. This is a deep, well drained soil on fans and foot slopes on uplands and mountains. It formed in colluvium and alluvium. The elevation is 3,000 to 6,000 feet. Slopes are mainly medium in length. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

Typically, the surface layer of this soil is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam 13 inches thick. The upper part of the substratum is grayish brown sandy loam 17 inches thick, and the lower part is grayish brown very gravelly coarse sandy loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and moderately rapid below that. The available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Belain and Benz soils are included with this soil in mapping. The Belain soil is gently sloping and moderately deep. It is on knolls. The Benz soil is gently sloping and is strongly affected by sodium. It is in very small depressions.

The Hedoes soil is used mainly as rangeland. In small areas it is used for irrigated and dryland crops. The main dryland crops are wheat, barley, and oats. The main irrigated crops are alfalfa for hay and barley.

Wind erosion is the main limitation to use of this soil for cultivated crops; however, strip cropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and big sagebrush increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. The moderate available water capacity restricts the choice of shrubs and trees to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, lilac, silver buffaloberry, and Nanking cherry.

This soil is suited to most urban uses. Because permeability in the substratum is moderately rapid, underground water supplies can be polluted by liquid and solid wastes from sanitary disposal systems.

Capability subclass Ille, dryland, and Ile, irrigated; Silty range site, 15- to 19-inch precipitation zone.

62—Hedoes loam, 4 to 8 percent slopes. This is a deep, well drained soil on fans and foot slopes on uplands and mountains. It formed in colluvium and alluvium. The elevation is 3,000 to 6,000 feet. Slopes are mainly medium in length. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

Typically, the surface layer of this soil is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam 13 inches thick. The upper part of the substratum is grayish brown sandy loam 17 inches thick. The lower part is grayish brown very gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and moderately rapid below that. The available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

Small areas of Benz, Belain, and Castner soils are included with this soil in mapping. The Benz soil is gently sloping and strongly affected by sodium. It is in small depressions on the lower part of slopes. The Belain soil is moderately sloping and moderately deep. It is on the upper part of slopes on knolls and ridges. The Castner soil is strongly sloping and shallow. It is on top of knolls and ridges.

The Hedoes soil is used mainly as rangeland. In a few small areas it is used for dryland and irrigated crops. The main dryland crops are wheat, barley, and oats. The main irrigated crops are alfalfa for hay and barley.

Wind and water erosion is the main limitation to use of this soil for cultivated crops. Strip cropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour strip cropping, and grassed waterways can effectively control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue,

bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and big sagebrush increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. The moderate available water capacity restricts the choice of shrubs and trees. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, lilac, silver buffaloberry, and Nanking cherry.

This soil is suited to urban uses. Because permeability in the substratum is moderately rapid, underground water supplies can be polluted by liquid and solid wastes from sanitary disposal systems.

Capability subclass IIle, dryland, and IIle, irrigated; Silty range site, 15- to 19-inch precipitation zone.

63—Hedoes-Belain loams, 4 to 15 percent slopes.

This complex consists of moderately sloping to strongly rolling soils on fans, foot slopes, hillsides, and ridges. The elevation is 3,000 to 6,000 feet. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

The Hedoes soil makes up about 60 percent of the map unit, and the Belain soil makes up about 30 percent. Included with these soils in mapping are small areas of Benz, Castner, and Farnuf soils. These soils make up about 10 percent of the unit. The Benz soil is strongly affected by sodium in small, sparsely vegetated depressions. The Castner soil is strongly sloping and shallow. It is on top of ridges and knolls.

The Hedoes soil is deep and well drained. It formed in colluvium and alluvium on fans and foot slopes.

Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam 13 inches thick. The upper part of the substratum is grayish brown sandy loam 17 inches thick, and the lower part is grayish brown, very gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and moderately rapid below that. The available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

The Belain soil is moderately deep and well drained. It formed on hills, ridges, and the upper part of slopes in

material that weathered from hard igneous rock.

Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam and gravelly loam 11 inches thick. The substratum is brown gravelly loam and very gravelly loam 13 inches thick. Igneous bedrock is at a depth of 28 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is medium. Wind and water erosion are moderate hazards. The depth to hard igneous bedrock is 20 to 40 inches.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland and irrigated crops. The main dryland crops are barley, oats, and wheat. The main irrigated crop is alfalfa for hay.

Droughtiness and wind and water erosion are the main limitations to use of these soils for cultivated crops. Because of droughtiness, successful crop production depends on suitable distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall grass barriers for trapping windblown snow help to conserve moisture. Stripcropping, tall grass barriers, minimum tillage, and stubble mulch tillage can effectively control wind and water erosion.

The soils in this complex are suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils in this complex can be used for windbreaks. The droughtiness of these soils restricts the choice of trees and shrubs. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

Mixed stands of aspen, Douglas-fir, and ponderosa pine grow on these soils in the moister areas. The stands of ponderosa pine and Douglas-fir are productive enough to have commercial value. Ponderosa pine has a site index of about 60 to 70 and Douglas-fir, 40 to 45.

Hard igneous bedrock at a depth of 20 to 40 inches in the Belain soil limits these soils for most urban uses. The depth to hard bedrock seriously limits the construction of houses with basements and the design

of sanitary waste disposal systems. Underground water supplies can be polluted by waste from sanitary disposal systems.

Capability subclass IVe, dryland, and IIIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

64—Hedoes-Belain loams, 15 to 35 percent slopes.

This complex consists of hilly to steep soils on fans and foot slopes and on sides of hills and mountains. The elevation is 3,000 to 6,000 feet. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

The Hedoes soil makes up about 45 percent of this map unit, and the Belain soil makes up about 40 percent. Included with these soils in mapping, and making up 15 percent of the unit, are small areas of Farnuf and Castner soils and of Rock outcrop.

The Hedoes soil is deep and well drained. It formed in colluvium and alluvium on fans and foot slopes.

Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam 13 inches thick. The upper part of the substratum is grayish brown sandy loam 17 inches thick, and the lower part is grayish brown very gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and moderately rapid below that. The available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is medium. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Belain soil is moderately deep and well drained. It formed on the upper part of slopes on hills, ridges, and mountains in material weathered from hard igneous rock. Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam and gravelly loam 11 inches thick. The substratum is brown gravelly loam and very gravelly loam 13 inches thick. Igneous bedrock is at a depth of 28 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth to hard igneous bedrock is 20 to 40 inches.

The soils in this complex are not suitable for cultivated crops because of slope and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Hedoes soil. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue

and bluebunch wheatgrass decrease and Idaho fescue, needleandthread, blue grama, prairie junegrass, and threadleaf sedge increase. Weedy plants likely to invade are annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

Mixed stands of aspen, Douglas-fir, and ponderosa pine grow on these soils in the moister areas. The stands of ponderosa pine and Douglas-fir are productive enough to have commercial value. Ponderosa pine has a site index of about 60 to 70 and Douglas-fir, 40 to 45.

The soils in this complex are not suited to windbreaks because slopes are more than 15 percent.

Slope limits these soils for most urban uses. Hard bedrock at a depth of 20 to 40 inches in the Belain soil is also a limitation for most urban uses.

Capability subclass VIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

65—Hedoes-Belain-Castner complex, 15 to 60 percent slopes. This complex consists of moderately steep to steep Hedoes soil, steep Belain soil, and very steep Castner soil on hills, ridges, and mountains (fig. 1). The elevation is 3,000 to 6,000 feet. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

The Hedoes soil makes up about 40 percent of this map unit, the Belain soil makes up about 25 percent, and the Castner soil about 20 percent. Included with these soils in mapping, and making up about 15 percent of the unit, are small areas of Perma soil and Rock outcrop. The steep to very steep Perma soil is on the side slopes of hills, ridges, and mountains. This soil contains a high amount of rock fragments, and it is droughty. The Rock outcrop is on ridgetops.

The Hedoes soil is deep and well drained. It formed in alluvium and colluvium on fans and foot slopes. Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam 13 inches thick. The substratum is grayish brown sandy loam 17 inches thick, and the lower part is grayish brown, very gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and moderately rapid below that. The available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard.

The Belain soil is moderately deep and well drained. It formed on the upper part of slopes on ridges, hills, and mountains in material that weathered from hard igneous rock. Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam and gravelly loam 11 inches thick. The substratum is brown



Figure 1.—The Hedoes-Belain-Castner complex is on the barren hilly area in the background. The Macmeal association is in the wooded area on the left. The Hedoes-Belain loams are on the slopes in the center foreground.

gravelly loam and very gravelly loam 13 inches thick. Igneous bedrock is at a depth of 28 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. Hard igneous bedrock is at a depth of 20 to 40 inches.

The Castner soil is shallow and well drained. It formed on hills, ridges, and mountains in material that weathered from hard igneous rock and hard sandstone. Typically, the surface layer is dark grayish brown gravelly loam 6 inches thick. The substratum is brown very channery loam 7 inches thick. Hard bedrock is at a depth of 13 inches.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 13 inches. The average annual wetting depth of the soil

under native vegetation is 13 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. The depth to hard rock is 10 to 20 inches.

The soils in this complex are not suited to cultivated crops because of slope and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced by the Hedoes and Belain soils. The potential plant community on these soils consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. The potential plant community on the Castner soil consists mainly of bluebunch wheatgrass, rough fescue, green needlegrass, Idaho fescue, needleandthread, and conifers. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue and

bluebunch wheatgrass decrease and Idaho fescue, needleandthread, blue grama, fringed sagewort, prairie junegrass, and threadleaf sedge increase. Weedy plants likely to invade are annual grasses, broom snakeweed, and pussytoes.

On the Hedoes soil, the potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years. On the Belain soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds in unfavorable years. On the Castner soil, forage production is 1,200 pounds per acre in favorable years and 700 pounds in unfavorable years.

The soils in this complex are poorly suited to timber production. However, a few ponderosa pine and Douglas-fir trees of merchantable quality are on the north aspects.

These soils are not suited for windbreaks because the slopes are more than 15 percent.

The moderately steep to very steep slopes and the depth to bedrock in the Belain and Castner soils limit these soils for most urban uses.

Capability subclass VIIe, dryland. The Hedoes soil is in Silty range site, 15- to 19-inch precipitation zone; the Belain soil is in Thin Hilly range site, 15- to 19-inch precipitation zone; and the Castner soil is in Shallow range site, 15- to 19-inch precipitation zone.

66—Hedoes-Benz loams, 2 to 4 percent slopes.

This complex consists of gently sloping soils on fans, terraces, and foot slopes. The elevation is 3,000 to 6,000 feet. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

The Hedoes soil makes up about 70 percent of the map unit, and the Benz soil makes up about 20 percent. Included with these soils in mapping, and making up about 10 percent of the unit, are small areas of Belain and Farnuf soils. The Belain soil is gently sloping and moderately sloping and moderately deep. It is on low knolls and ridges.

The Hedoes soil is deep and well drained. It formed in colluvium and alluvium on fans, terraces, and foot slopes. Typically, the surface layer is dark grayish brown loam 4 inches thick. The subsoil is dark brown loam 13 inches thick. The upper part of the substratum is grayish brown sandy loam 17 inches thick, and the lower part is grayish brown very sandy loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 17 inches and moderately rapid below that. The available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Benz soil is deep and well drained. It formed in alluvium in barren or nearly barren small depressions.

Typically, the surface layer is grayish brown loam 3 inches thick. The substratum is mainly grayish brown loam and clay loam stratified with thin lenses of fine sandy loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 25 inches. Runoff is medium. Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is strongly affected by sodium. When dry, it is very hard, and a crust forms on the surface.

These soils are used mainly as rangeland. In some areas they are used for dryland crops. The main crops are wheat, barley, and oats.

Wind erosion is the main limitation to use of these soils for cultivated crops, but strip cropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

These soils are suited to use as rangeland. Most of the forage is produced on the Hedoes soil. The potential plant community on the Hedoes soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. The potential plant community on the Benz soil consists of needleandthread, western wheatgrass, prairie junegrass, Sandberg bluegrass, inland saltgrass, Nuttall saltbush, and greasewood. Forbs are decreasers. If the rangeland is overgrazed, rough fescue, green needlegrass, bluebunch wheatgrass, western wheatgrass, and Nuttall saltbush decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are Kentucky bluegrass, foxtail barley, Hood phlox, and pussytoes.

On the Hedoes soil, the potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years. On the Benz soil, forage production is 400 pounds per acre in favorable years and 200 pounds in unfavorable years.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

The Hedoes soil can be used for windbreaks. The moderate available water capacity restricts the choice of trees and shrubs. Suitable trees are Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffalberry. The Benz soil is not suited to windbreaks because it is strongly affected by sodium.

The slow permeability of the Benz soil limits these soils for most urban uses. Septic tank absorption fields on the Benz soil require special design because of the slow permeability. Because permeability in the substratum of the Hedoes soil is moderately rapid, waste

from sanitary disposal systems can pollute underground water supplies.

Capability subclass IVs, dryland. Hedoes soil is in Silty range site, 15- to 19-inch precipitation zone; Benz soil is in Saline Upland range site, 15- to 19-inch precipitation zone.

67—Hillon clay loam, 25 to 45 percent slopes. This is a deep, well drained, steep soil on glaciated uplands. It formed in glacial till. The elevation is 2,300 to 3,600 feet. Slopes are mainly short. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is brown clay loam 4 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 26 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

Small areas of Kevin, Lisam, and Cabbart soils are included with this soil in mapping. The Lisam and Cabbart soils are on the steeper part of slopes. The Kevin soil is on foot slopes.

This soil is not suited to cultivated crops because of the steep slope and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of western wheatgrass, bluebunch wheatgrass, needleandthread, green needlegrass, prairie sandreed, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, bluebunch wheatgrass, and green needlegrass decrease and needleandthread, blue grama, and threadleaf sedge increase. Weedy plants likely to invade are annual grasses, needleleaf sedge, and broom snakeweed. The potential plant community produces 900 pounds of forage per acre in favorable years and 300 pounds in unfavorable years.

This soil is not suited to windbreaks because of the steep slope.

Slope is the main limitation to use of this soil for most urban uses.

Capability subclass VIIe, dryland; Thin Hilly range site, 10- to 14-inch precipitation zone.

68—Hillon-Kevin clay loams, 15 to 35 percent slopes. This complex consists of soils on glaciated uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Hillon soil makes up about 45 percent of this map unit, and the Kevin soil makes up about 40 percent.

Included with these soils in mapping are small areas of Chinook, Scobey, and Yamac soils. These soils make up about 15 percent of the unit.

The Hillon soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer is brown clay loam 4 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is about 26 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard.

The Kevin soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer, if mixed to a depth of 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

These soils are not suited to cultivated crops because of slope and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

The soils in this complex are suited to use as rangeland and are used as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, little bluestem, and prairie sandreed. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease and needleandthread, prairie junegrass, blue grama, and threadleaf sedge increase. Weedy plants likely to invade are annual grasses, needleleaf sedge, broom snakeweed, and clubmoss. The potential plant community produces 900 pounds of forage per acre in favorable years and 300 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

The soils in this complex are not suited to windbreaks because of slope. Slope also limits these soils for most urban uses.

Capability subclass VIe, dryland; Thin Hilly range site, 10- to 14-inch precipitation zone.

69—Hillon-Scobey clay loams, 4 to 20 percent slopes. This complex consists of strongly rolling to hilly

Hillon soil and gently rolling Scobey soil on glaciated uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Hillon soil makes up about 40 percent of this map unit, and the Scobey soil makes up about 40 percent. Included with these soils in mapping are small areas of Dimmick, Nishon, and Kevin soils. These soils make up about 20 percent of the unit. The level or nearly level Dimmick and Nishon soils are in small enclosed basins.

The Hillon soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer is brown clay loam 4 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 26 inches. Runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The soil is calcareous, and yields from cultivated crops are low.

The Scobey soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is grayish brown clay loam 6 inches thick. The upper part of the subsoil is brown clay 6 inches thick, and the lower part is grayish brown clay loam 7 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

The soils in this complex are used mainly as rangeland. In small areas they are used for dryland crops. The main crops are wheat, barley, and oats.

Wind and water erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion. A permanently and adequately maintained cover of planted grasses or of natural vegetation also helps control wind and water erosion.

These soils are suited to use as rangeland. Most of the forage is produced on the Scobey soil. The potential plant community on the Scobey soil consists of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. The potential plant community on the Hillon soil consists mainly of western wheatgrass, green needlegrass, bluebunch wheatgrass, winterfat, and prairie sandreed. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, and bluebunch wheatgrass decrease and needleandthread, blue grama, prairie junegrass, fringed sagewort, and threadleaf sedge increase. Weedy plants likely to invade are annual grasses, clubmoss, and broom snakeweed.

On the Hillon soil, the potential plant community produces 900 pounds of forage per acre in favorable years and 300 pounds in unfavorable years. On the Scobey soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability and slope of the Hillon soil and the slow permeability of the Scobey soil limit these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability of both soils and the slope of the Hillon soil.

Capability subclass IVe, dryland. Hillon soil is in Thin Hilly range site, 10- to 14-inch precipitation zone; Scobey soil is in Silty range site, 10- to 14-inch precipitation zone.

70—Judith-Windham complex, 4 to 8 percent slopes. This complex consists of gently rolling soils on terraces and fans on uplands. The elevation is 3,200 to 4,500 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Judith soil makes up about 55 percent of this map unit, and the Windham soil makes up about 35 percent. Included with these soils in mapping, and making up about 10 percent of the unit, are small areas of Martinsdale soil.

The Judith soil is deep and well drained. It formed in alluvium on the lower part of slopes. Typically, the surface layer is dark grayish brown loam 5 inches thick. The upper part of the substratum is pale brown and very pale brown loam 33 inches thick, and the lower part is pale brown very gravelly loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 33 inches and moderately rapid below that. The available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion is a moderate hazard. The Judith soil has a high content of lime at a shallow depth and is droughty.

The Windham soil is deep and well drained. It formed in alluvium on terraces and fans. Typically, the surface

layer is dark grayish brown gravelly loam 6 inches thick. The substratum, to a depth of 60 inches or more, is pale brown very gravelly loam.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion is a moderate hazard. This soil has many coarse fragments throughout the profile, and it is very droughty.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops. The main crops are wheat and barley.

Wind erosion, water erosion, and droughtiness are the main limitations to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion. Tall grass barriers, minimum tillage, and tillage that utilizes crop residue also help conserve moisture.

These soils are suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, basin wildrye, and a few ponderosa pine. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, blue grama, western wheatgrass, prairie junegrass, fringed sagewort, common snowberry, and big sagebrush increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils in this complex can be used for windbreaks. The content of lime at a shallow depth and droughtiness limit the choice of trees and shrubs. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The moderately rapid permeability in the substratum of the Judith soil limits these soils for most urban uses. Because permeability in the substratum is moderately rapid, ground water can be polluted by liquid and solid waste from disposal systems.

Capability subclass IVs, dryland; Silty range site, 15- to 19-inch precipitation zone.

71—Judith-Windham complex, 8 to 15 percent slopes. This complex consists of strongly rolling soils on terraces and fans on uplands. The elevation is 3,200 to 4,500 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Judith soil makes up about 45 percent of this map unit, and the Windham soil makes up about 45 percent. Included with these soils in mapping, and making up about 10 percent of the unit, are small areas of Martinsdale soil.

The Judith soil is deep and well drained. It formed in alluvium on the lower part of slopes. Typically, the surface layer is dark grayish brown loam 5 inches thick. The substratum is pale brown and very pale brown loam to a depth of 33 inches and very pale brown very gravelly loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 33 inches and moderately rapid below that. The available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion is a moderate hazard. The Judith soil has a high content of lime at a shallow depth, and it is droughty.

The Windham soil is deep and well drained. It formed in alluvium on terraces and fans. Typically, the surface layer is dark grayish brown gravelly loam 6 inches thick. The substratum, to a depth of 60 inches, is pale brown very gravelly loam.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion is a moderate hazard. This soil has many coarse fragments throughout the profile, and it is very droughty.

The soils in this complex are poorly suited to cultivated crops because of slope and droughtiness.

These soils are suited to use as rangeland and are used as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, basin wildrye, and ponderosa pine. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, blue grama, needleandthread, western wheatgrass, prairie junegrass, fringed sagewort, common snowberry, and big sagebrush increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. The high content of lime at a shallow depth and droughtiness limit the choice of trees and shrubs. Suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The moderately rapid permeability in the substratum of the Judith soil limits these soils for most urban uses.

Because permeability in the substratum is moderately rapid, ground water can be polluted by liquid and solid waste from disposal systems.

Capability subclass IVe, dryland; Silty range site, 15- to 19-inch precipitation zone.

72—Kevin clay loam, 2 to 8 percent slopes. This is a deep, well drained, undulating to gently rolling soil on uplands. It formed in glacial till. The elevation is 2,300 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer, where mixed, is grayish brown clay loam to a depth of 7 inches. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is about 36 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

Small areas of Elloam, Hillon, Phillips, and Scobey soils are included with this soil in mapping. The Hillon soil is strongly rolling and is on knolls and ridges.

The Kevin soil is used as rangeland and for dryland crops. The main dryland crops are wheat, barley, and oats. The soil is also used for irrigated alfalfa for hay.

Wind and water erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps control erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease and needleandthread, prairie junegrass, blue grama, and fringed sagewort increase. Weedy plants likely to invade are annual grasses, clubmoss, and broom snakeweed. The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white

willow, golden willow, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland, and IIIe, irrigated; Silty range site, 10- to 14-inch precipitation zone.

73—Kevin-Elloam clay loams, 2 to 8 percent slopes. This complex consists of undulating to gently rolling soils on glaciated plains. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Kevin soil makes up about 60 percent of this map unit, and the Elloam soil makes up about 20 percent. Included with these soils in mapping, and making up about 20 percent of the unit, are small areas of Hillon, Phillips, Scobey, and Thoeny soils. The Thoeny soil is in vegetated depressions.

The Kevin soil is deep and well drained. It formed in glacial till in smooth areas on uplands. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

The Elloam soil is deep and well drained. It formed in glacial till in sparsely vegetated, small depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is light brownish gray clay loam. The subsoil is grayish brown clay loam 10 inches thick. The substratum is mostly grayish brown clay loam to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is medium. Wind and water erosion is a moderate hazard.

The subsoil of the Elloam soil is moderately affected by sodium. When the subsoil is mixed with the surface layer, the surface tends to crust, which reduces seedling emergence and crop yields.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops. The main crops are barley, wheat, and oats.

Wind and water erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion. A permanent and adequately maintained cover

of planted grasses or of natural vegetation also helps control erosion.

These soils are well suited to use as rangeland. Most of the forage is produced on the Kevin soil. The potential plant community on the Kevin soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. The potential plant community on the Elloam soil consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, and greasewood. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, and Nuttall saltbush decrease and needleandthread, blue grama, fringed sagewort, prairie junegrass, and shrubby cinquefoil increase. Weedy plants likely to invade are annual grasses, broom snakeweed, plains pricklypear, and clubmoss.

On the Kevin soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds in unfavorable years. On the Elloam soil, forage production is 800 pounds per acre in favorable years and 300 pounds in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, allows desirable native plants to become reestablished, and thus forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. For the Kevin soil, suitable trees include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac. For the Elloam soil, suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability in the Kevin soil and the very slow permeability in the Elloam soil limit these soils for most urban uses. Septic tank absorption fields require special design because of the slow and very slow permeability.

Capability subclass IVs, dryland. Kevin soil is in Silty range site, 10- to 14-inch precipitation zone; Elloam soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

74—Kevin-Hillon clay loams, 8 to 15 percent slopes. This complex consists of strongly rolling soils on glaciated uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Kevin soil makes up about 45 percent of the map unit, and the Hillon soil makes up about 45 percent. Included with these soils in mapping, and making up about 10 percent of the unit, are small areas of Elloam and Scobey soils. The Elloam soil is in sparsely vegetated, small depressions.

The Kevin soil is deep and well drained. It formed in glacial till on uplands. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Hillon soil is deep and well drained. It formed in glacial till on the tops of knolls and ridges. Typically, the surface layer is brown clay loam 4 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 26 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

These soils are used mainly as rangeland and for dryland crops. The main dryland crops are wheat, barley, and oats.

Wind and water erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

These soils are suited to use as rangeland. Most of the forage is produced on the Kevin soil. The potential plant community on the Kevin soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Forbs are decreasers. The potential plant community on the Hillon soil consists of western wheatgrass, bluebunch wheatgrass, needleandthread, green needlegrass, prairie sandreed, and winterfat. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, bluebunch wheatgrass, winterfat, and green needlegrass decrease and needleandthread, blue grama, prairie junegrass, fringed sagewort, and threadleaf sedge increase. Weedy plants likely to invade are annual grasses, broom snakeweed, and clubmoss.

On the Kevin soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds in unfavorable years. On the Hillon soil, forage production is 900 pounds in favorable years and 300 pounds in unfavorable years.

Clubmoss is very competitive and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of slow permeability.

Capability subclass IVe, dryland. Kevin soil is in Silty range site, 10- to 14-inch precipitation zone; Hillon soil is in Thin Hilly range site, 10- to 14-inch precipitation zone.

75—Korent-Nesda complex, occasionally flooded.

This complex consists of nearly level soils on stream terraces and flood plains. The elevation is 2,600 to 4,000 feet. Slopes are 0 to 2 percent. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Korent soil makes up about 40 percent of this map unit, and the Nesda soil makes up about 40 percent. Included with these soils in mapping, and making up about 20 percent of the map unit, are small areas of Farnuf and Straw soils.

The Korent soil is deep and well drained. It formed in alluvium. Typically, the surface layer is dark grayish brown silt loam 7 inches thick. The upper part of the substratum is brown silty clay loam 7 inches thick. The lower part is grayish brown sandy clay loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind and water erosion is a moderate hazard. This soil is subject to occasional flooding in spring.

The Nesda soil is deep and well drained. It formed in alluvium. Typically, the surface layer is grayish brown loam 7 inches thick. The subsurface layer is brown sandy loam 4 inches thick. The substratum is grayish brown, very gravelly loamy sand 4 inches thick. The lower part is pale brown, very gravelly sand to a depth of 60 inches.

Permeability is moderate to a depth of about 11 inches and rapid or very rapid below that. The available water capacity is very low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil

under native vegetation is 40 inches. Runoff is slow. Wind and water erosion is a moderate hazard. Very gravelly sand is at a depth of less than 20 inches, which causes droughtiness. This soil is subject to occasional flooding in spring.

The soils in this complex are not suited to cultivated crops because of flooding. They are suited to use as rangeland, and they are used as rangeland. Most of the forage is produced on the Korent soil. The potential plant community on the Korent soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. The potential plant community on the Nesda soil consists mainly of bluebunch wheatgrass, green needlegrass, needleandthread, and western wheatgrass. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, fringed sagewort, needleandthread, blue grama, common snowberry, and big sagebrush increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, broom snakeweed, annual grasses, and Hood phlox.

On the Korent soil, the potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years. On the Nesda soil, forage production is 900 pounds in favorable years and 500 pounds in unfavorable years.

These soils can be used for windbreaks. Suitable trees for the Korent soil include Russian-olive, green ash, Siberian elm, white willow, golden willow, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac. Suitable trees for the Nesda soils include Russian-olive, Siberian crabapple, and ponderosa pine. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The hazard of occasional flooding limits these soils for most urban uses.

Capability subclass Vw, dryland. Korent soil is in Silty range site, 15- to 19-inch precipitation zone; Nesda soil is in Shallow to Gravel range site, 15- to 19-inch precipitation zone.

76—Lardell silty clay loam. This is a deep, somewhat poorly drained, nearly level soil on flood plains and stream terraces in valleys. It formed in alluvium. The elevation is 2,300 to 2,700 feet. Slopes are 0 to 2 percent and are mainly short. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is grayish brown silty clay loam 8 inches thick. The substratum, to a depth of 29 inches, is grayish brown silty clay loam, and below that, to a depth of 60 inches, it is light brownish gray loam stratified with thin lenses of fine sandy loam to silty clay

loam. When the soil is dry, many fine salt crystals are visible throughout the profile.

Permeability is slow, and the available water capacity is low because of the effect of salts. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is very strongly affected by salts and sodium. It is subject to rare flooding. The water table is at a depth of 12 to 60 inches in summer.

Small areas of Havre, Harlem, and Nobe soils are included with this soil in mapping. Also included, in small areas on the bottom lands of Woody Island Coulee, are soils that have a clayey subsoil and soils that have a very gravelly substratum at a depth of 30 to 60 inches.

The Lardell soil is not suited to cultivated crops because of the very strong effect of salts and sodium.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of alkali sacaton, basin wildrye, Nuttall alkaligrass, Nuttall saltbush, and greasewood. If the rangeland is overgrazed, basin wildrye, alkali sacaton, and Nuttall saltbush decrease; and inland saltgrass increases. Foxtail barley, curlycup gumweed, and kochia are likely to invade. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,200 pounds in unfavorable years.

The Lardell soil is not suitable for windbreaks because of the low available water capacity and the effect of salts and sodium.

The hazard of rare flooding and the water table limit this soil for most urban uses.

Capability subclass VIIw, dryland; Saline Lowland range site, 10- to 14-inch precipitation zone.

77—Lihen loamy fine sand, 0 to 6 percent slopes.

This is a deep, well drained, undulating to gently rolling soil on terraces on uplands. It formed in alluvial and eolian material. The elevation is 2,400 to 3,000 feet. Slopes are mainly short. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is dark brown loamy fine sand 10 inches thick. The layer below that is brown loamy fine sand to a depth of 30 inches. The substratum, to a depth of 60 inches, is pale brown loamy fine sand.

Permeability is rapid, and the available water capacity is low. The effective rooting depth is about 60 inches. The average wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard. This soil is droughty.

Small areas of Chinook and Vida soils are included with this soil in mapping.

The Lihen soil is used mainly as rangeland. In small areas it is used for dryland and irrigated crops. The main

dryland crops are wheat, barley, and oats. The main irrigated crop is alfalfa hay.

Droughtiness and wind erosion are the main limitations to use of this soil for cultivated crops. Because of droughtiness, successful crop production depends on a suitable distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall grass barriers for trapping windblown snow help conserve moisture. Stripcropping, tall grass barriers, minimum tillage, and stubble mulch tillage can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps control erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, and needleandthread. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, Indian ricegrass and prairie sandreed decrease and needleandthread and green sagewort increase. Some woody plants are increasers. Weedy plants likely to invade are annual grasses and needleleaf sedge. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

This soil is suited to most urban uses. Because permeability is rapid, underground water supplies can be polluted by liquid and solid wastes from disposal systems.

Capability subclass IVe, dryland, and IVe, irrigated; Sands range site, 10- to 14-inch precipitation zone.

78—Lihen loamy fine sand, 6 to 12 percent slopes.

This is a deep, well drained, gently rolling to strongly sloping soil on terraces on glaciated uplands. It formed in alluvial and eolian material. The elevation is 2,400 to 3,000 feet. Slopes are mainly short. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is dark brown loamy fine sand 10 inches thick. The layer below that is brown loamy fine sand to a depth of 30 inches. The substratum, to a depth of 60 inches, is pale brown loamy fine sand.

Permeability is rapid, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of this soil under native vegetation is 40 inches. Runoff is moderate. Wind erosion is a severe hazard, and water erosion is a moderate hazard. This soil is droughty.

Small areas of Chinook and Vida soils are included with this soil in mapping.

This soil is not suited to cultivated crops because of severe wind erosion, moderate water erosion, and droughtiness. A permanent and adequately maintained cover of natural vegetation helps control wind erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of Indian ricegrass, prairie sandreed, and needleandthread. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, Indian ricegrass and prairie sandreed decrease and needleandthread and fringed sagewort increase. Some woody plants are increasers. Weedy plants likely to invade are annual grasses and needleleaf sedge. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,000 pounds in unfavorable years.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

This soil is suited to most urban uses. Because permeability is rapid, underground water supplies can be polluted by liquid and solid wastes from disposal systems.

Capability subclass VIe, dryland; Sandy range site, 10- to 14-inch precipitation zone.

79—Lisam-Dilts clays, 8 to 35 percent slopes. This complex consists of strongly sloping to steep soils on uplands. The elevation is 2,400 to 4,000 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Lisam soil makes up about 45 percent of the map unit, and the Dilts soil makes up about 35 percent. Included with these soils in mapping, and making up about 20 percent of the unit, are small areas of Bascovy, Marvan, and Vanda soils and of shale outcrop.

The Lisam soil is shallow and well drained. It formed on side slopes of knolls and ridges in material that weathered from soft clayey shale. Typically, the surface layer is grayish brown clay 6 inches thick. The substratum is grayish brown clay and olive gray shaly clay 11 inches thick. Below that, to a depth of 60 inches, there is olive gray platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 17 inches. The average annual wetting depth of the soil under native vegetation is 17 inches. Runoff is medium to rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Soft clayey shale is at a depth of 10 to 20 inches.

The Dilts soil is shallow and well drained. It formed on side slopes of knolls and ridges in material that weathered from soft acid shale. Typically, the surface layer is grayish brown clay that is 3 inches thick and that

has a thin, massive crust. The substratum is grayish brown clay and shaly clay 13 inches thick. Below that, to a depth of 60 inches, there is grayish brown platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 16 inches. The average annual wetting depth of the soil under native vegetation is 16 inches. Runoff is medium to rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Acid shale is at a depth of 10 to 20 inches.

The soils in this complex are not suited to cultivated crops because of the slope, the moderate hazard of wind erosion, the severe hazard of water erosion, and the very low available water capacity. A permanent and adequately maintained cover of natural vegetation helps control wind and water erosion.

These soils are suited to use as rangeland and are used as rangeland. The potential plant community consists mainly of bluebunch wheatgrass, green needlegrass, winterfat, western wheatgrass, and little bluestem. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass, green needlegrass, and western wheatgrass decrease and prairie junegrass, plains muhly, and big sagebrush increase. Some forbs are increasers. Weedy plants likely to invade are curlycup gumweed, broom snakeweed, and annual grasses. The potential plant community produces 1,000 pounds of forage per acre in favorable years and 500 pounds in unfavorable years.

The soils in this complex are very poorly suited to timber production. There are, however, a few ponderosa pine and limber pine trees of merchantable quality on the north and east aspects.

These soils are unsuited to use for windbreaks because of the very low available water capacity.

Slope and shallowness to shale limit these soils for most urban uses. Where slopes are less than 15 percent, septic tank absorption fields require special design because of the shallowness to shale. Where slopes are more than 15 percent, septic tank absorption fields require special design because of the slope and the shallowness to shale.

Capability subclass VIe, dryland; Shallow Clay range site, 10- to 14-inch precipitation zone.

80—Lisam-Dilts-Rock outcrop, shale complex, 25 to 60 percent slopes. This complex consists of steep soils and Rock outcrop on uplands (fig. 2). The elevation is 2,300 to 4,000 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Lisam soil makes up about 30 percent of the map unit, the Dilts soil makes up about 30 percent, and the shale outcrop about 30 percent. Included in mapping, and making up about 10 percent of the unit, are small areas of Bascovy, Marvan, and Vanda soil.

The Lisam soil is shallow and well drained. It formed on side slopes of hills and ridges in material that

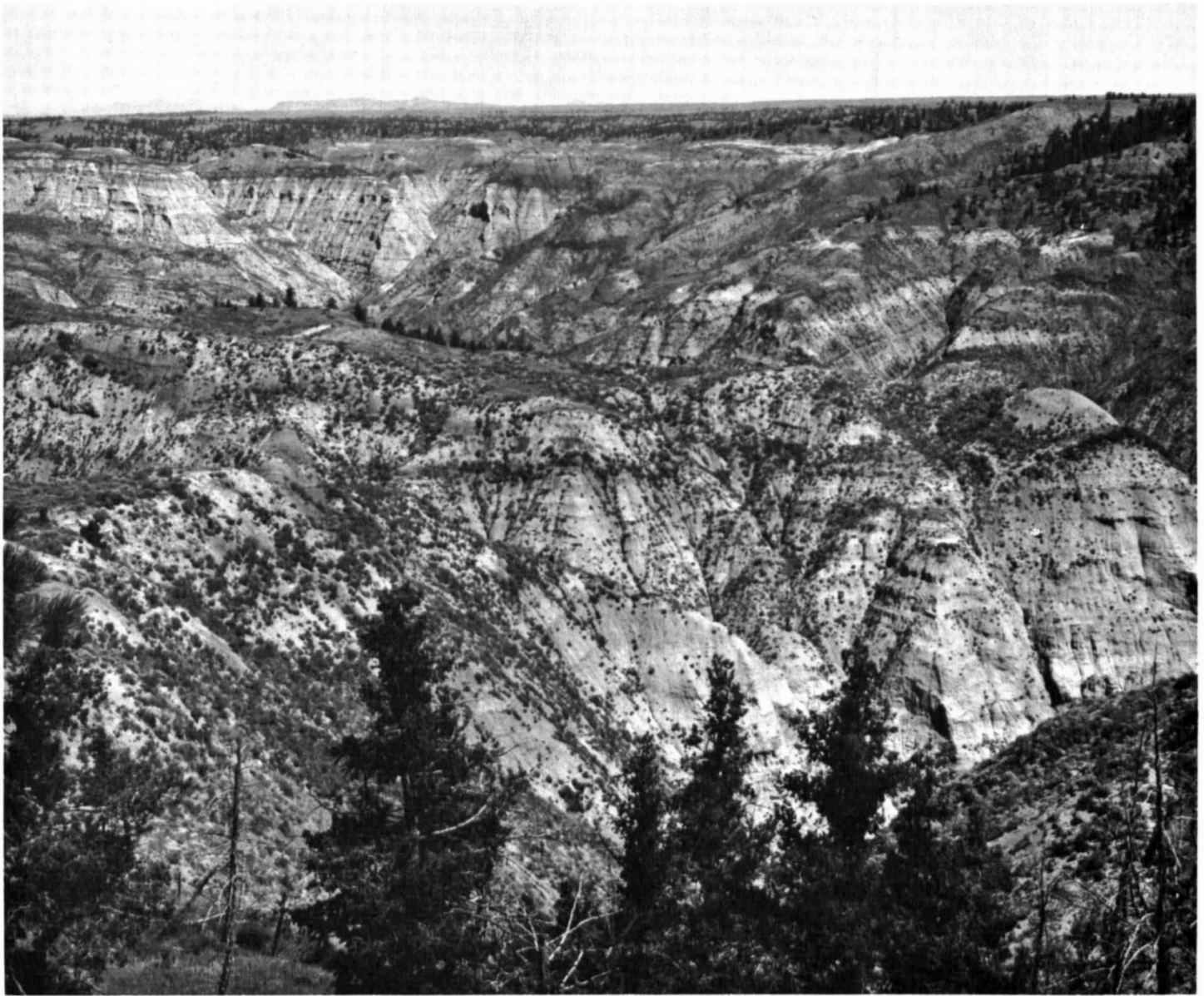


Figure 2.—Typical area of Lisam-Dilts-Rock outcrop, shale complex, 25 to 60 percent slopes. Sparse stands of ponderosa pine in the foreground are on Lisam-Dilts clays. Lisam-Dilts clays in the center have less moisture and support only grass and shrubs. The light-colored, steep, barren areas are Rock outcrop, shale.

weathered from soft clayey shale. Typically, the surface layer is grayish brown clay 6 inches thick. The substratum is grayish brown clay and olive gray shaly clay 11 inches thick. Below that, to a depth of 60 inches, there is olive gray soft platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 17 inches. The average annual wetting depth of the soil under native vegetation is 17 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a

moderate hazard. Soft clayey shale is at a depth of 10 to 20 inches.

The Dilts soil is shallow and well drained. It formed on side slopes of hills and ridges in material that weathered from soft acid shale. Typically, the surface layer is grayish brown clay that is 3 inches thick and that has a thin, massive crust. The substratum is grayish brown soft platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 16 inches. The average annual wetting depth of the soil

under native vegetation is 16 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Soft platy acid shale is at a depth of 10 to 20 inches.

Rock outcrop, shale, consists of exposed beds of mainly grayish brown or gray clay shale on hillsides, ridges, and knolls and along drainageways. Runoff is rapid. Water erosion is a severe hazard.

The soils in this complex are not suited to cultivated crops because of slope, the moderate hazard of wind erosion, the severe hazard of water erosion, the very low available water capacity, and the outcropping of shale. A permanent and adequately maintained cover of natural vegetation helps control wind and water erosion.

These soils are suited to use as rangeland, and they are used as rangeland. Most of the forage is produced on the Lisam and Dilts soils. Steep and very steep slopes make livestock grazing difficult. The potential plant community consists mainly of bluebunch wheatgrass, western wheatgrass, green needlegrass, little bluestem, and winterfat. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass, western wheatgrass, green needlegrass, and winterfat decrease and prairie junegrass, plains muhly, and big sagebrush increase. Some forbs are increasers. Weedy plants likely to invade are broom snakeweed, curlycup gumweed, and foxtail barley. The potential plant community produces 1,000 pounds of forage per acre in favorable years and 500 pounds in unfavorable years.

The soils in this complex are very poorly suited to timber production. There are, however, a few ponderosa pine and limber pine trees of merchantable quality on the north and east aspects.

The rate of tree growth on these soils is less than 35 cubic feet per acre per year. Existing stands are of limited commercial value; they should be maintained for watershed protection and for wildlife habitat.

The soils in this complex are not suited to windbreaks because of slope.

Steep and very steep slopes and shallowness to shale limit these soils for most urban uses.

Capability subclass VIIe, dryland; Shallow Clay range site, 10- to 14-inch precipitation zone.

81—Lisam-Hillon association, steep. This association consists of soils on uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Lisam soil makes up about 50 percent of the mapping unit, and the Hillon soil makes up about 35 percent. Included in mapping, and making up about 15 percent of the unit, are small areas of Bascovy, Kevin, Marvan, and Vanda soil and of shale outcrop.

The Lisam soil is shallow and well drained. It formed on lower side slopes of hills and ridges in material that weathered from soft clayey shale. Typically, the surface

layer is grayish brown clay 6 inches thick. The substratum is grayish brown clay and olive gray shaly clay 11 inches thick. Below that, to a depth of 60 inches, there is olive gray platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 17 inches. The average annual wetting depth of the soil under native vegetation is 17 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. The depth to soft clayey shale is 10 to 20 inches.

The Hillon soil is deep and well drained. It is on upper side slopes of hills and ridges and formed in glacial till. Typically, the surface layer is brown clay loam 4 inches thick. The substratum, to a depth of 60 inches or more, is grayish brown clay loam.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 26 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard.

The soils in this association are not suited to cultivated crops because of the steep slopes, the moderate hazard of wind erosion, and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps control wind and water erosion.

These soils are suited to use as rangeland, and they are used as rangeland. The potential plant community on the Lisam soil consists mainly of western wheatgrass, bluebunch wheatgrass, green needlegrass, little bluestem, winterfat, and greasewood. Forbs are decreasers. The potential plant community on the Hillon soil consists mainly of western wheatgrass, little bluestem, needleandthread, green needlegrass, and prairie sandreed. Forbs are decreasers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, and bluebunch wheatgrass decrease and needleandthread, blue grama, threadleaf sedge, prairie junegrass, plains muhly, and big sagebrush increase. Weedy plants likely to invade are broom snakeweed, curlycup gumweed, and annual grasses.

On the Lisam soil, the potential plant community produces 1,000 pounds of forage per acre in favorable years and 500 pounds in unfavorable years. On the Hillon soil, forage production is 900 pounds per acre in favorable years and 400 pounds in unfavorable years.

The soils in this association are not suitable for windbreaks because of the steep slopes.

Slope and shallowness to shale on the Lisam soil limit these soils for most urban uses.

Capability subclass VIe, dryland. Lisam soil is in Shallow Clay range site, 10- to 14-inch precipitation zone; Hillon soil is in Thin Hilly range site, 10- to 14-inch precipitation zone.

82—Lisam-Wabek association, steep. This association consists of soils on uplands. The elevation is

2,800 to 4,000 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Lisam soil makes up about 55 percent of the map unit, and the Wabek soil makes up 30 percent. Included with these soils in mapping, and making up 15 percent of the unit, are small areas of Marvan and Bascovy soils and areas of shale outcrop.

The Lisam soil is shallow and well drained. It formed on the side slopes of hills and ridges in material that weathered from soft clayey shale. Typically, the surface layer is grayish brown clay 6 inches thick. The substratum is grayish brown clay and olive gray shaly clay 11 inches thick. Below that, to a depth of 60 inches, there is olive gray platy shale that rubs to clay or clay loam.

Permeability is slow, and the available water capacity is very low. The effective rooting depth is about 17 inches. The average annual wetting depth of the soil under native vegetation is 17 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Soft clayey shale is at a depth of 10 to 20 inches.

The Wabek soil is deep and well drained. It is on the upper part of slopes on the edges of outwash terraces and crests of ridges. It formed in alluvium. Typically, the surface layer is mainly dark brown gravelly loam 8 inches thick. The upper part of the substratum is light brownish gray very gravelly loamy coarse sand 7 inches thick. The lower part, to a depth of 60 inches, is grayish brown very gravelly coarse sand.

Permeability is moderately rapid to a depth of about 8 inches and very rapid below that. The available water capacity is very low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The soils in this association are not suited to cultivated crops because of slope.

The soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Lisam soil. The potential plant community on the Lisam soil consists mainly of bluebunch wheatgrass, western wheatgrass, little bluestem, green needlegrass, and winterfat. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, bluebunch wheatgrass, western wheatgrass, prairie sandreed, green needlegrass, and little bluestem decrease; prairie junegrass, plains muhly, big sagebrush, blue grama, prairie junegrass, and fringed sagewort increase; and annual grasses, clubmoss, red threeawn, broom snakeweed, and curlycup gumweed invade.

On the Lisam soil, the potential plant community produces 1,000 pounds of forage per acre in favorable years and 500 pounds per acre in unfavorable years. On the Wabek soil, forage production is 900 pounds per acre in favorable years and 500 pounds in unfavorable years.

The soils in this association are very poorly suited to timber production. There are, however, a few ponderosa pine and limber pine trees of merchantable quality on the north and south aspects.

The soils are not suited to windbreaks because of the steep slopes.

The steep slopes limit these soils for most urban uses.

Capability subclass Vle, dryland. Lisam soil is in Shallow to Clay range site, 10- to 14-inch precipitation zone; Wabek soil is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

83—Lolo loam. This is a deep, well drained, nearly level to gently sloping soil on fans and stream terraces in mountain valleys. It formed in alluvium. The elevation is 3,000 to 4,500 feet. Slopes are 0 to 4 percent and are mainly short. The average annual precipitation is 16 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the upper part of the surface layer is very dark grayish brown loam 6 inches thick. The lower part is dark grayish brown gravelly loam 16 inches thick. The subsoil is grayish brown very gravelly sandy loam 16 inches thick. The substratum is very gravelly sandy loam to a depth of 60 inches.

Permeability is moderately rapid, and the available water capacity is low. The effective rooting depth is about 40 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard.

Small areas of Nesda, Korent, and Straw soils are included with this soil in mapping. The Nesda soil is gently sloping and is along stream channels.

The Lolo soil is used as rangeland and for irrigated crops. The main crops are barley and alfalfa for hay.

Droughtiness and wind erosion are the main limitations to use of this soil for cultivated crops. Because of droughtiness, successful crop production depends on a suitable distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall grass barriers for trapping windblown snow help conserve moisture. Stripcropping, tall grass barriers, minimum tillage, and stubble mulch tillage can effectively control wind erosion. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, basin wildrye, and ponderosa pine. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox,

pussytoes, and clubmoss. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses. Because permeability is moderately rapid, underground water supplies can be polluted by liquid and solid wastes from disposal systems.

Capability subclass IVe, dryland, and IIIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

84—Macmeal association, steep. The soils in this association are mainly in the Little Rocky Mountains. The elevation is 4,000 to 6,000 feet. The average annual precipitation is 19 inches, and the average annual temperature is 40 degrees F. The average growing season is 90 days.

Macmeal soil, south aspect, makes up about 55 percent of the association; Macmeal soil, north aspect, makes up about 35 percent. Included in mapping, and making up about 10 percent of the unit, are small areas of Castner and Silverchief soils and of Rock outcrop. The steep, shallow Castner soil and the Rock outcrop are on ridges and hills. The moderately sloping to steep Silverchief soil is on foot slopes and fans.

Macmeal soils are deep and well drained. They formed in colluvium or alluvium that weathered from igneous and metamorphic rock on mountainsides. Macmeal soil, north aspect, has a higher effective moisture regime than Macmeal soil, south aspect.

Typically, the surface layer of the Macmeal soil, north aspect, is covered by an organic mat 2 inches thick. The surface layer is pale brown gravelly loam 7 inches thick. The upper part of the subsoil is yellowish brown very gravelly clay loam 7 inches thick. The middle part is yellowish brown extremely channery clay loam 34 inches thick. The lower part is brown, extremely flaggy clay loam to a depth of 60 inches.

Typically, the surface layer of the Macmeal soil, south aspect, is light brownish gray gravelly loam 2 inches thick. The subsurface layer is pale brown gravelly loam 3 inches thick. The upper part of the subsoil is yellowish brown very gravelly clay loam 9 inches thick. The middle part, to a depth of 48 inches is yellowish brown, extremely channery clay loam 34 inches thick. The lower part is brown, extremely flaggy clay loam to a depth of 60 inches.

Permeability is moderately slow. The available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of these soils under native vegetation is 40 inches. Runoff is rapid.

Wind erosion is a moderate hazard, and water erosion is a severe hazard.

A permanent and adequately maintained cover of natural vegetation helps control wind and water erosion.

The Macmeal soils are suitable for use as woodland. The vegetation on these soils was altered in 1936 by a fire that burned most of the trees in the Little Rocky Mountains. Forests of lodgepole pine and some Douglas-fir regenerated on nearly all of the north and east slopes. Grasses and shrubs cover the south and west slopes and protect the soils from erosion. This vegetation is in strong competition with emerging trees for moisture and nutrients and has delayed the reestablishment of forests on the south and west slopes. However, there are scattered stands of trees, mainly ponderosa pine.

The soils in this association are used as rangeland and woodland. The potential forest understory plant community on north and east slopes consists mainly of pinegrass, common snowberry, Oregon grape, bearded wheatgrass, Columbia needlegrass, blue wildrye, common juniper, arrowleaf balsamroot, white spirea, common chokecherry, russet buffaloberry, twinflower, heartleaf arnica, kinnikinnick, and lupine. The forest understory on south and west slopes consists mainly of bluebunch wheatgrass, Saskatoon serviceberry, little bluestem, skunkbush sumac, and common snowberry. If the forest overstory becomes less dense, the amount of forage produced in the understory increases and the composition of the understory changes. If the rangeland is overgrazed, Columbia needlegrass, bluebunch wheatgrass, and blue wildrye decrease and common snowberry, arrowleaf balsamroot, and lupine increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, and cheatgrass.

The potential native plant community of the nonforested Macmeal soils is similar to that of the forest understory on south and west slopes.

The soils in this association are not suited to windbreaks because the slopes are more than 15 percent.

The Macmeal soil, north aspect, is suited to the production of Douglas-fir and lodgepole pine. It is capable of producing about 4,495 total cubic feet, or 11,510 board feet (Scribner rule), per acre of Douglas-fir and 6,510 total cubic feet, or 17,221 board feet, per acre of lodgepole pine. The Macmeal soil, south aspect, is suited to the production of ponderosa pine. It is capable of producing about 4,325 total cubic feet, or 10,450 board feet (Scribner rule), per acre of ponderosa pine. These production levels are from fully stocked, even-aged, unmanaged stands of 100-year-old trees.

The main restrictions to use of these soils for timber production are steep slopes, clay in the subsoil, and low available water capacity. Steep slopes limit the use of equipment in forest management. To reduce soil erosion, logs should not be skidded in drainageways. Various trails should be used in skidding operations to prevent

deeply rutted paths from forming. Clay in the subsoil reduces trafficability in wet seasons. The low available water capacity limits regeneration and increases seedling mortality. Site scarification during harvest and regeneration is necessary to reduce plant competition and seedling mortality.

The steep and very steep slopes limit these soils for most urban uses.

Capability subclass VIIe, dryland.

85—Marmarth-Cabbart complex, 2 to 8 percent slopes. This complex consists of Marmarth and Cabbart soils on uplands. These soils are at an elevation of 2,800 to 3,800 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Marmarth soil makes up about 50 percent of the map unit, and the Cabbart soil makes up 35 percent. Included with these soils in mapping, and making up about 15 percent of the unit, are small areas of Delpoint, Ethridge, Marvan, and Riedel soils and small areas of Rock outcrop. Ethridge soils are nearly level and gently sloping, and Marvan soils are moderately affected by sodium. These soils are on lower slopes. Rock outcrop consists of ridges and knolls. Riedel soils are undulating and gently rolling and shallow. They are on knolls and ridges.

The Marmarth soil is moderately deep and well drained. It formed on the lower part of the slope in material that weathered from soft siltstone. Typically, the surface layer is dark brown clay loam 6 inches thick. The upper part of the subsoil is brown clay loam 8 inches thick. The lower part is grayish brown clay loam 4 inches thick. The substratum is light brownish gray sandy clay loam 12 inches thick. Below that, to a depth of 60 inches, there is soft siltstone and thin strata of soft sandstone. The soft sedimentary beds rub to loam.

Permeability is moderate, and the available water capacity is moderate. The effective rooting depth is about 30 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion are moderate hazards. The soft sedimentary beds are at a depth of 20 to 40 inches.

The Cabbart soil is shallow and well drained. It formed on knolls and ridges in material that weathered from soft siltstone. Typically, the surface layer is grayish brown loam 4 inches thick. The substratum is grayish brown loam 8 inches thick. Below that, to a depth of 60 inches, there is soft siltstone that rubs to loam, silt loam, or clay loam.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 12 inches. The average annual wetting depth of the soil under native vegetation is 12 inches. Runoff is medium. Wind and water erosion are moderate hazards. The depth to soft sedimentary beds ranges from 10 to 20 inches.

The soils in this complex are used for dryland crops and as rangeland. The main dryland crops are wheat, barley, and oats. Wind and water erosion are the main limitations to use of these soils for cultivated crops. The Cabbart soil, in addition, is droughty. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

These soils are suited to use as rangeland. The bulk of the forage is produced on the Marmarth soil. The potential plant community on the Marmarth soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, and silver sagebrush. Some forbs are decreasers. The potential plant community on the Cabbart soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, western wheatgrass, green needlegrass, bluebunch wheatgrass, and needleandthread decrease; blue grama, prairie junegrass, and fringed sagewort increase; and annual grasses, broom snakeweed, and needleleaf sedge invade.

On the Marmarth soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Cabbart soil, forage production is 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The Cabbart and Marmarth soils can be used for windbreaks. The choice of trees and shrubs, however, is restricted to those that are drought resistant because of the moderate and very low available water capacity. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

The soft siltstone at a depth of 20 to 40 inches in the Marmarth soil and the soft siltstone at a depth of 10 to 20 inches in the Cabbart soil are limitations for most urban uses. Septic tank absorption fields on these soils require special design because of the siltstone.

Capability subclass IVe, dryland. Marmarth soil is in Silty range site, 10- to 14-inch precipitation zone; Cabbart soil is in Shallow range site, 10- to 14-inch precipitation zone.

86—Martinsdale clay loam, 0 to 4 percent slopes.

This is a deep, well drained, nearly level to gently sloping soil on terraces and fans on uplands. It formed in alluvium. The elevation is 3,200 to 4,500 feet. Slopes are mainly long. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days. Typically, the surface layer, where it is mixed to a depth

of about 7 inches, is dark brown clay loam. The subsoil is mostly brown clay loam 6 inches thick. The substratum is light gray and pale brown clay loam to a depth of 54 inches; below that, it is pale brown gravelly clay loam to a depth of 60 inches.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 40 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Judith, Turner, and Work soils are included in mapping. The Turner soil is nearly level to gently sloping, and the Judith soil is gently sloping. These soils are on the upper part of low ridges and knolls.

The Martinsdale soil is used for dryland crops and as rangeland. The main dryland crops are wheat, oats, and barley. Wind erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Some sedges, forbs, and woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye and an increase of plants such as Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and big sagebrush. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. The high content of lime at a depth of about 13 inches limits the choice of trees and shrubs to those that are tolerant of lime. Suitable trees include Russian-olive, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

The moderately slow permeability of this soil is a limitation for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

87—Martinsdale-Judith complex, 2 to 8 percent slopes. This complex consists of undulating to gently rolling soils on terraces and fans on uplands. The elevation is 3,200 to 4,500 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Martinsdale soil makes up about 50 percent of this map unit, and the Judith soil makes up 40 percent. Included in mapping are small areas of Windham and Work soils. These soils make up about 10 percent of the map unit. The Windham soil is strongly sloping. It is on ridges and on the edge of terraces.

The Martinsdale soil is deep and well drained. It formed in alluvium on the lower part of slopes. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is dark brown clay loam. The subsoil is mostly brown clay loam 6 inches thick. The substratum is light gray and pale brown clay loam to a depth of 54 inches; below that, it is pale brown gravelly clay loam to a depth of 60 inches.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 40 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow or medium. Wind and water erosion are moderate hazards.

The Judith soil is deep and well drained. It formed in alluvium on the upper part of slopes on ridges and knolls. Typically, the surface layer is dark grayish brown loam 5 inches thick. The substratum is pale brown and very pale brown loam to a depth of 33 inches; below that, it is very pale brown very gravelly loam to a depth of 60 inches or more.

Permeability is moderate to a depth of about 33 inches and moderately rapid below that depth. The available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow or medium. Wind and water erosion are moderate hazards. This soil is calcareous, and yields from cultivated crops are low.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops, mainly wheat, oats, and barley. Wind and water erosion are the main limitations to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

The soils in this complex are suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. Continued excessive

grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye and an increase of plants such as Idaho fescue, needleandthread, western wheatgrass, prairie junegrass, bluegrass, fringed sagewort, common snowberry, and big sagebrush. Weedy plants likely to invade are clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. The high content of lime at a shallow depth limits the choice of trees and shrubs to those that are tolerant of lime. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, lilac, and skunkbush sumac.

The moderately slow permeability of the Martinsdale soil is a limitation for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability. Because permeability in the substratum of the Judith soil is moderately rapid, ground water can be polluted by liquid and solid wastes from sanitary disposal systems.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

88—Marvan clay, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil. It formed in clayey alluvium on fans and terraces in valleys and on uplands (fig. 3). The elevation is 2,300 to 3,000 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown clay 7 inches thick. The substratum is grayish brown clay to a depth of 23 inches and, below that, grayish brown silty clay to a depth of 60 inches.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Harlem, Ethridge, and Vanda soils are included with this soil in mapping. The Vanda soil is level to gently sloping. It is in sparsely vegetated areas, and it is strongly affected by sodium.

The Marvan soil is used mainly as rangeland. In some areas it is used for irrigated and dryland crops. The main irrigated crops are alfalfa for hay, wheat, and barley. The



Figure 3.—Marvan clay on the alluvial fan in the foreground; Rock outcrop, shale, in the background; and Havre loam along Cow Creek.

main dryland crops are wheat and barley. Wind erosion and a moderate content of sodium are the main limitations to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

The Marvan soil is suited to use as rangeland. The potential plant community consists mainly of green needlegrass, Nuttall saltbush, winterfat, and forbs. If the rangeland is overgrazed, green needlegrass and western wheatgrass decrease and Sandberg bluegrass, blue grama, threadleaf sedge, silver sagebrush, prairie junegrass, and fringed sagewort increase. Weedy plants that are likely to invade are clubmoss, annual grasses, and curlycup gumweed. Forage production is 1,300 pounds per acre in favorable years and 700 pounds per acre in unfavorable years.

This soil can be used for windbreaks. Because the soil is moderately affected by sodium, the choice of shrubs and trees is restricted to those that are resistant to sodium. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry.

The high shrink-swell potential, low strength, and very slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the very slow permeability. Foundations and basements for houses require special design because of the high shrink-swell potential and low soil strength.

Capability subclass IVs, dryland, and IVe, irrigated; Clayey range site, 10- to 14-inch precipitation zone.

89—Marvan-Bascovy clays, 2 to 8 percent slopes.

This complex consists of gently sloping to moderately sloping Marvan and Bascovy soils on uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Marvan soil makes up about 45 percent of the map unit, and the Bascovy soil makes up 40 percent. Included with these soils in mapping, and making up 15 percent of the map unit, are small areas of Dilts, Lisam, and Vanda soils and areas of shale outcrop. The moderately sloping and moderately steep Dilts and Lisam soils are on the top of ridges and knolls. They are shallow soils. The gently sloping Vanda soil is in sparsely vegetated areas and is strongly affected by sodium.

The Marvan soil is deep and well drained. It formed in clayey alluvium on fans and the lower part of slopes. Typically, the surface layer is grayish brown clay 7 inches thick. The substratum is grayish brown clay to a depth of 23 inches and, below that, grayish brown silty clay to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is

about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Bascovy soil is moderately deep and well drained. It formed on knolls, ridges, and the upper part of slopes in material that weathered from soft shale. Typically, the surface layer is grayish brown clay 6 inches thick. There is a very thin light brownish gray vesicular crust on the surface. The subsoil is olive gray clay 9 inches thick. The substratum is olive gray clay 8 inches thick. Below the substratum, to a depth of 60 inches, there is olive gray and olive brown, soft clayey shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 23 inches. The average annual wetting depth of the soil under native vegetation is 23 inches. Runoff is medium. Wind and water erosion are moderate hazards. The depth to soft clayey shale ranges from 20 to 40 inches.

Because the Marvan soil is moderately affected by sodium and the Bascovy soil is droughty, the suitability for cultivated crops is poor.

The soils in this complex are suited to use as rangeland and are used as rangeland. The potential plant community on the Marvan and Bascovy soils consists mainly of western wheatgrass, green needlegrass, Canby bluegrass, Nuttall saltbush, winterfat, and forbs. If the rangeland is overgrazed, green needlegrass, Canby bluegrass, and western wheatgrass decrease and Sandberg bluegrass, prairie junegrass, big sagebrush, and fringed sagewort increase. Weedy plants that are likely to invade are clubmoss, annual grasses, and curlycup gumweed. The potential plant community produces 1,300 pounds of forage per acre in favorable years and 700 pounds per acre in unfavorable years.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Because the Marvan soil is moderately affected by sodium and the Bascovy soil is droughty, the choice of shrubs and trees is restricted. On the Marvan soil, suitable trees include Russian-olive and Siberian elm, and suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry. On the Bascovy soil, suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The high shrink-swell potential, low strength, and very slow permeability of the soils in this complex are limitations for urban uses. Soft shale at a depth of 20 to 40 inches in the Bascovy soil is an additional limitation. Septic tank absorption fields require special design because of the very slow permeability. Foundations and basements for houses require special design because of the high shrink-swell potential and low strength.

Capability subclass IVs, dryland; Clayey range site, 10- to 14-inch precipitation zone.

90—Nishon loam. This is a deep, somewhat poorly drained, nearly level soil in closed basins on glaciated uplands. It formed in alluvium. The elevation is 2,500 to 3,300 feet. Slopes are 0 to 1 percent. The average annual precipitation is 13 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is light brownish gray loam 12 inches thick. The subsoil is grayish brown clay 9 inches thick. The substratum is olive clay to a depth of 16 inches and, below that, pale olive clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 60 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. The soil is subject to ponding in spring and summer. The water table is at a depth of 6 to 36 inches in summer.

Small areas of Dimmick soil are included in mapping. The Dimmick soil is level to nearly level; it is in the lower part of the basins.

The Nishon soil is used for dryland farming and as rangeland. The main crops are wheat and barley.

Ponding and wetness are the main limitations to use of this soil for cultivated crops. Ponding delays the seeding or harvesting of crops in most years.

This soil is suited to use as rangeland. The potential plant community consists mainly of basin wildrye, green needlegrass, western wheatgrass, and Canby bluegrass. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, basin wildrye and green needlegrass decrease and western wheatgrass, sedges, and silver sagebrush increase. Woody plants, Kentucky bluegrass, and annual plants are likely to invade. Forage production is 2,000 pounds per acre in favorable years and 1,200 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Windbreak species that are tolerant of frequent wetness should be used. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, and white and golden willow. Suitable shrubs include common chokecherry, lilac, and American plum.

Ponding and wetness limit the use of this soil for most urban uses.

Capability subclass IIIw, dryland; Overflow range site, 15- to 19-inch precipitation zone.

91—Nishon clay loam. This is a deep, poorly drained, nearly level soil in closed basins on glaciated uplands. It formed in alluvium. The elevation is 2,500 to 3,300 feet. Slopes are 0 to 1 percent. The average annual precipitation is 13 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is light brownish gray clay loam 5 inches thick. The subsoil is mostly gray clay, and the substratum, to a depth of 60 inches, is also gray clay.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 60 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard. The soil is subject to ponding in spring and in summer. The water table is at a depth of 6 to 36 inches in summer.

Small areas of Dimmick soils are included in mapping. The Dimmick soil is nearly level. It is in the lower part of closed basins, and it too is subject to ponding.

The Nishon soil is poorly suited to use as cropland because of ponding and wetness. Ponding delays the seeding or harvesting of a crop about half of the time.

This soil is suited to use as rangeland and is used mainly as rangeland. The potential plant community consists mainly of basin wildrye, green needlegrass, western wheatgrass, Canby bluegrass, and slender wheatgrass. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as basin wildrye and green needlegrass and an increase of western wheatgrass, sedges, and silver sagebrush. Woody plants, Kentucky bluegrass, and annual plants are likely to invade. The potential plant community produces 2,000 pounds of forage per acre in favorable years and 1,200 pounds in unfavorable years.

This soil can be used for windbreaks; however, it is subject to prolonged wetness, so only those trees and shrubs that are tolerant of wetness should be used. Suitable trees include Russian-olive, Siberian elm, white willow, and golden willow. Suitable shrubs include common chokecherry and silver buffaloberry.

The ponding and wetness limit this soil for most urban uses.

Capability subclass IVw, dryland; Overflow range site, 15- to 19-inch precipitation zone.

92—Norbert clay, 8 to 35 percent slopes. This is a shallow, well drained, strongly sloping to steep soil on uplands. It formed in material that weathered from soft clayey shale. The elevation is 2,500 to 4,400 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is olive gray clay 10 inches thick. The substratum is olive gray very shaly clay 4 inches thick. Below that, to a depth of 60 inches, there is soft platy shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is very low. The effective rooting depth is about 14 inches. The average annual wetting depth of the soil under native vegetation is 14 inches. Runoff is rapid.

Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth to soft platy shale is 10 to 20 inches.

Small areas of Barkof and Marvan soils and areas of shale outcrop are included in mapping. The shale outcrop is on top of some knolls and ridges and in eroded areas along drainageways.

The Norbert soil is not suited to cultivated crops because of its very low available water capacity, the shallowness to platy shale, the severe hazard of water erosion, and the steepness of the slope. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of bluebunch wheatgrass, green needlegrass, western wheatgrass, and winterfat. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass, green needlegrass, and winterfat and an increase of plants such as western wheatgrass, Sandberg bluegrass, plains reedgrass, and fringed sagewort. Annual grasses, broom snakeweed, Hood phlox, and rubber rabbitbrush are likely to invade. Forage production is 1,600 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The high shrink-swell potential, slope, very slow permeability, and shallowness to shale limit this soil for most urban uses. Septic tank filter fields on this soil require special design because of the very slow permeability, slope, and shallowness to shale.

Capability subclass VIe, dryland; Shallow Clay range site, 15- to 19-inch precipitation zone.

93—Norbert-Rock outcrop, shale complex, 25 to 60 percent slopes. This complex consists of steep Norbert soil and steep to very steep Rock outcrop, shale, on uplands. The elevation is 2,500 to 4,400 feet. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Norbert soil makes up about 60 percent of this map unit, and Rock outcrop, shale, makes up 30 percent. Included in mapping, and making up about 10 percent of the map unit, are small areas of Barkof, Marvan, and Vanda soils.

The Norbert soil is shallow and well drained. It formed on the upper slopes of hills, knolls, and ridges in material that weathered from soft clayey shale. Typically, the surface layer is olive gray clay 10 inches thick. The substratum is olive gray very shaly clay 4 inches thick. Below that, to a depth of 60 inches, there is platy shale that rubs to clay or clay loam.

Permeability is very slow, and the available water capacity is very low. The effective rooting depth is about 14 inches. The average annual wetting depth of the soil under native vegetation is 14 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a

moderate hazard. Soft shale is at a depth of 10 to 20 inches.

Rock outcrop, shale, is on the side of hills and eroded drainageways.

The soils in this complex are not suited to cultivated crops because of the steep slopes, the severe hazard of water erosion, and the shallowness to platy shale. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

These soils are suited to use as rangeland and are used as rangeland, although the steep and very steep slopes make grazing difficult for livestock. The potential plant community on the Norbert soil consists mainly of bluebunch wheatgrass, western wheatgrass, green needlegrass, winterfat, and plains muhly. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass, winterfat, green needlegrass, and forbs and an increase of Idaho fescue, needleandthread, blue grama, and fringed sagewort. Weedy plants that are likely to invade are annual grasses, Kentucky bluegrass, broom snakeweed, and pussytoes. Forage production on the Norbert soil is 1,600 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The soils are very poorly suited to timber production. There are, however, a few ponderosa pine, limber pine, and Douglas-fir trees of merchantable quality on north-facing slopes. There are also a few ponderosa pine and limber pine trees of merchantable quality on south-facing slopes.

These soils are not suited to windbreaks because of the steep slopes and the very low available water capacity.

The steep and very steep slopes, shrink-swell potential, and shallowness to shale limit these soils for most urban uses.

Capability subclass VIIe, dryland; Norbert soil is in Shallow Clay range site, 15- to 19-inch precipitation zone.

94—Perma-Castner-Belain complex, 25 to 60 percent slopes. This complex consists of steep to very steep Perma and Castner soils and steep Belain soil on hills, ridges, and mountains. The elevation is 3,000 to 6,000 feet. The average annual precipitation is 17 inches, and the average annual temperature is 42 degrees F. The average growing season is 105 days.

The Perma soil makes up about 40 percent of the map unit, the Castner soil makes up 25 percent, and the Belain soil makes up 20 percent. Included with these soils in mapping are small areas of Hedoes soil and areas of Rock outcrop. These included areas make up about 15 percent of the map unit.

The Perma soil is deep and well drained. It formed on the lower part of steep slopes in colluvium or alluvium of igneous rock and hard sandstone. Typically, the surface layer is very dark grayish brown gravelly loam and dark grayish brown, very gravelly loam 11 inches thick. The

subsoil is brown, very gravelly loam 29 inches thick. The substratum, to a depth of 60 inches, is grayish brown, very gravelly loam (fig. 4).

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Castner soil is shallow and well drained. It formed on ridges, hills, and mountains in material that weathered from hard sandstone and hard igneous rock. Typically, the surface layer is dark grayish brown gravelly loam 6 inches thick. The substratum is brown very channery loam 7 inches thick. Hard bedrock is at a depth of 13 inches.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 13 inches. The average annual wetting depth of the soil under native vegetation is 13 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. Bedrock is at a depth of 10 to 20 inches.

The Belain soil is moderately deep and well drained. It formed on the upper part of slopes in material that weathered from hard igneous rock. Typically, the surface layer is dark grayish brown loam 4 inches thick. The

subsoil is dark brown loam and gravelly loam 11 inches thick. The substratum is brown gravelly loam and very gravelly loam 13 inches thick. Igneous bedrock is at a depth of 28 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is rapid. Water erosion is a severe hazard, and wind erosion is a moderate hazard. The depth to hard rock is 20 to 40 inches.

The soils in this complex are not suited to cultivated crops because of the steep slopes and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps control water erosion.

The soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Perma and Belain soils. The potential plant community on the Perma and Belain soils consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. On the Castner soil the potential plant community consists mainly of bluebunch wheatgrass, rough fescue, green needlegrass, Idaho fescue, needleandthread, and Rocky Mountain juniper. Some forbs and woody plants are decreasers. If the rangeland is overgrazed, rough fescue and bluebunch wheatgrass decrease; Idaho fescue, common snowberry, Woods rose, common chokecherry, needleandthread, blue grama, prairie junegrass, and fringed sagewort increase; and clubmoss, annual grasses, broom snakeweed, and pussytoes invade.

On the Perma soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years. On the Castner soil, forage production is 1,200 pounds per acre in favorable years and 700 pounds per acre in unfavorable years. On the Belain soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The soils in this complex are poorly suited to timber production. There are, however, a few ponderosa pine and Douglas-fir trees of merchantable quality on north-facing slopes.

The soils in this complex are not suited to windbreaks because slopes are more than 15 percent.

The steep slopes limit these soils for most urban uses.

Capability subclass VIIe, dryland. Perma soil is in Thin Hilly range site, 15- to 19-inch precipitation zone; Castner soil is in Shallow range site, 15- to 19-inch precipitation zone; and Belain soil is in Thin Hilly range site, 15- to 19-inch precipitation.

95—Phillips loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to undulating soil that formed in glacial till on uplands. The elevation is 2,400 to 3,600 feet. Slopes are mainly long. The average annual



Figure 4.—Profile of Perma gravelly loam showing the very gravelly substratum.

precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is brown loam 2 inches thick. The subsurface layer is pale brown and light brownish gray loam 5 inches thick. The subsoil is brown clay and grayish brown clay loam 15 inches thick. The substratum is grayish brown clay loam to a depth of 78 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Elloam, Thoeny, Kevin, and Scobey soils are included with this soil in mapping. The Elloam soil is nearly level; it is in small depressions and is moderately affected by sodium. The Thoeny soil is in vegetated depressions.

The Phillips soil is used for dryland crops, mainly wheat, barley, and oats. Small areas are irrigated for wheat, barley, and alfalfa. Wind erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and stubble mulch tillage can effectively control wind erosion.

This soil is suited to use as rangeland and is used mainly as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of threadleaf sedge, prairie junegrass, needleandthread, blue grama, and fringed sagewort. Weedy plants likely to invade with continued grazing pressure are annual grasses, plains pricklypear, broom snakeweed, and clubmoss. Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokeberry, American plum, skunkbush sumac, and silver buffaloberry.

The slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 10- to 14-inch precipitation zone.

96—Phillips loam, 4 to 8 percent slopes. This is a deep, well drained, moderately sloping soil that formed in glacial till on uplands. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is brown loam 2 inches thick. The subsurface layer is pale brown and light brownish gray loam 5 inches thick. The subsoil is brown clay and grayish brown clay loam 15 inches thick. The substratum is grayish brown clay loam to a depth of 78 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

Small areas of Elloam, Thoeny, and Kevin soils are included with this soil in mapping. The Elloam soil is in small, sparsely vegetated depressions. It is moderately affected by sodium. The Thoeny soil is in vegetated depressions.

The Phillips soil is used mainly as rangeland. In some areas it is used for dryland crops, mainly wheat, barley, and oats. Wind and water erosion are the main limitations to use of this soil for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease and needleandthread, prairie junegrass, blue grama, threadleaf sedge, and fringed sagewort increase. Weedy plants likely to invade are annual grasses, plains pricklypear, snakeweed, and clubmoss. Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian

peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry.

The slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

97—Phillips-Elloam complex, 0 to 4 percent slopes.

This complex consists of nearly level to undulating Phillips and Elloam soils on glaciated uplands (fig. 5). The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Phillips soil makes up about 60 percent of the map unit, and the Elloam soil makes up 20 percent. Included with these soils in mapping are small areas of

Assinniboine, Kevin, Telstad, and Thoeny soils. These soils make up about 20 percent of the map unit. The Thoeny soil is in vegetated depressions.

The Phillips soil is deep and well drained. It formed in glacial till in smooth areas on uplands. Typically, the surface layer is brown loam 2 inches thick. The subsurface layer is pale brown and light brownish gray loam 5 inches thick. The subsoil is brown clay and grayish brown clay loam 15 inches thick. The substratum is grayish brown clay loam to a depth of 78 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Elloam soil is deep and well drained. It formed in glacial till, and it is in small, sparsely vegetated



Figure 5.—Area of Phillips-Elloam complex, 0 to 4 percent slopes, in native rangeland that has a heavy infestation of clubmoss. The Elloam soil is in the sparsely vegetated concave depressions, and the Phillips soil is in the raised, more densely vegetated areas.

depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is light brownish gray clay loam. The subsoil is grayish brown clay loam to a depth of 60 inches.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops, mainly wheat and barley.

Wind erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue are effective in controlling wind erosion.

The soils in this complex are well suited to use as rangeland. Most of the forage is produced on the Phillips soil. The potential plant community on the Phillips soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. The potential plant community on the Elloam soil consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needlegrass, and Nuttall saltbush and an increase of plants such as needleandthread, blue grama, fringed sagewort, and prairie junegrass. Weedy plants likely to invade are annual grasses, clubmoss, broom snakeweed, plains pricklypear, foxtail barley, and curlycup gumweed.

On the Phillips soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Elloam soil, forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils can be used for windbreaks. On the Phillips soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. The subsoil of the Elloam soil is moderately affected by sodium; thus, the choice of shrubs and trees is restricted. On the Elloam soil, suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability of the Phillips soil and the very slow permeability of the Elloam soil limit these soils for most urban uses. Septic tank absorption fields require special design because of the slow or very slow permeability.

Capability subclass IIIe, dryland. Phillips soil is in Silty range site, 10- to 14-inch precipitation zone; Elloam soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

98—Phillips-Elloam complex, 4 to 8 percent slopes.

This complex consists of gently rolling Phillips and Elloam soils on glaciated uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Phillips soil makes up about 60 percent of this map unit, and the Elloam soil makes up 20 percent. Included with these soils in mapping are small areas of Hillon, Thoeny, Kevin, Telstad, and Chinook soils. These soils make up about 20 percent of the map unit. The Thoeny soil is in vegetated depressions.

The Phillips soil is deep and well drained. It formed in glacial till in smooth areas on uplands. Typically, the surface layer is brown loam 2 inches thick. The subsurface layer is pale brown and light brownish gray loam 5 inches thick. The subsoil is brown clay and brown clay loam 15 inches thick. The substratum is grayish brown clay loam to a depth of 78 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Elloam soil is deep and well drained. It formed in glacial till in small, sparsely vegetated depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is light brownish gray clay loam. The subsoil is grayish brown clay loam 10 inches thick. The substratum is mostly grayish brown clay loam to a depth of 60 inches.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The soils in this complex are used mainly as rangeland. In some areas they are used for dryland crops, mainly wheat, oats, and barley.

Wind and water erosion are the main limitations to use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion. Because the subsoil of the Elloam soil is moderately affected by sodium and the surface is subject to crusting, seedling emergence is impeded and crop yields are reduced.

The soils in this complex are suited to use as rangeland. Most forage for grazing is produced on the Phillips soil. The potential plant community on the Phillips soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. The potential plant community on the Elloam soil consists mainly of western wheatgrass, green needlegrass, alkaligrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needlegrass, and Nuttall saltbush and an increase of needleandthread, blue grama, fringed sagewort, and prairie junegrass. Weedy plants likely to invade are annual grasses, broom snakeweed, plains pricklypear, and clubmoss.

On the Phillips soil, forage production is 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Elloam soil, forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils in this complex can be used for windbreaks. On the Phillips soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. The subsoil of the Elloam soil is moderately affected by sodium; thus the choice of shrubs and trees is restricted. On the Elloam soil, suitable trees include Russian-olive and Siberian elm. Suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability of the Phillips soil and the very slow permeability of the Elloam soil limit these soils for most urban uses. Septic tank absorption fields require special design because of the slow and very slow permeability.

Capability subclass IIIe, dryland. Phillips soil is in Silty range site, 10- to 14-inch precipitation zone; Elloam soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

99—Phillips-Kevin complex, 0 to 4 percent slopes.

This complex consists of nearly level to undulating Phillips soil and undulating Kevin soil on glaciated uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Phillips soil makes up about 50 percent of the map unit, and the Kevin soil makes up about 30 percent. Included with these soils in mapping are small areas of Elloam, Thoeny, Scobey, and Hillon soils. These soils make up about 20 percent of this map unit. The Elloam soil is in small, sparsely vegetated depressions. It is moderately affected by sodium.

The Phillips soil is deep and well drained. It formed in glacial till on uplands. Typically, the surface layer is brown loam 2 inches thick. The subsurface layer is pale brown and light brownish gray loam 5 inches thick. The subsoil is brown clay and grayish brown clay loam 15 inches thick. The substratum is grayish brown clay loam to a depth of 78 inches.

Permeability is slow, and the available water capacity is high. The effective wetting depth of the soil under native vegetation is about 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Kevin soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

In some areas the soils in this complex are used for dryland crops, mainly wheat, barley, and oats. Wind erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

The soils in this complex are well suited to use as rangeland and are used mainly as rangeland. The potential plant community on these soils consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of such plants as needleandthread, threadleaf sedge, prairie junegrass, blue grama, and fringed sagewort. Weedy plants likely to invade are annual grasses, broom snakeweed, and clubmoss. Forage production is 1,500 pounds per acre in favorable years, and 800 pounds per acre in unfavorable years for both the Phillips and Kevin soils.

Clubmoss is very competitive, and the possibility of heavy infestation by clubmoss is a very serious problem. Clubmoss forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. On the Phillips soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. On the Kevin soil, suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

100—Phillips-Kevin complex, 4 to 8 percent slopes.

This complex consists of gently rolling Phillips and Kevin soils on glaciated uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Phillips soil makes up about 40 percent of this map unit, and the Kevin soil makes up 40 percent. Included with these soils in mapping are small areas of Elloam, Thoeny, Scobey, and Hillon soils. These soils make up about 20 percent of the map unit. The Elloam soil is in small, sparsely vegetated depressions. It is moderately affected by sodium. The Thoeny soil is in vegetated depressions.

The Phillips soil is deep and well drained. It formed in glacial till on uplands. Typically, the surface layer is brown loam 2 inches thick. The subsurface layer is pale brown and light brownish gray loam 5 inches thick. The subsoil is brown clay and grayish brown clay loam 15 inches thick. The substratum is grayish brown clay loam to a depth of 78 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Kevin soil is deep and well drained. It formed in glacial till on the upper slopes of knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

In some areas the soils in this complex are used for dryland crops, mainly wheat, barley, and oats. Wind and

water erosion are the main limitations to use of these soils for cultivated crops.

Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

These soils are suited to use as rangeland and are used mainly as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of plants such as threadleaf sedge, prairie junegrass, needleandthread, blue grama, fringed sagewort, annual grasses, broom snakeweed, and clubmoss.

Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years for both the Phillips and Kevin soils.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. On the Phillips soil, suitable trees include Russian-olive, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, skunkbush sumac, and silver buffaloberry. On the Kevin soil, suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

101—Pits, gravel. This map unit consists of gravel pits on uplands. The areas are larger than 40 acres and have been stripped in mining gravel and sand. They are mostly on a large glacial outwash moraine south of Chinook. The elevation is 2,400 to 2,800 feet. Slopes range from 2 to 15 percent. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days. Runoff is slow.

Included in mapping are small areas of sand and gravel piles, mounds of overburden, and Wabek soils.

In some areas the gravel pits are nearly barren. They are mainly suited to use as a watershed and for wildlife habitat.

Capability class VIII, dryland.

102—Reeder loam, 2 to 4 percent slopes. This is a moderately deep, well drained soil on uplands. It formed in material that weathered from soft sedimentary beds. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark brown loam 7 inches thick. The subsoil is mostly dark brown clay loam 13 inches thick. The substratum is light brownish gray clay loam 8 inches thick. Soft sedimentary beds to a depth of 45 inches are light olive gray, soft siltstone that rubs to loam or silt loam. Below that, to a depth of 60 inches, the beds are light brownish gray, soft sandstone that rubs to loamy fine sand or fine sandy loam.

Permeability is moderate, and the available water capacity is moderate. The effective rooting depth is 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The depth to soft sedimentary beds ranges from 20 to 40 inches.

Included with this soil in mapping are a few small areas of Elloam, Cabba, Williams, and Vida soils and soils that formed in a thin layer of glacial till over the sedimentary beds. The Elloam soil is in small, sparsely vegetated depressions. It is moderately affected by sodium. The undulating Cabba soil is on knolls and ridges and is shallow.

The Reeder soil is used for dryland crops and as rangeland. The main dryland crops are wheat, oats, and barley. Wind erosion is a limitation to the use of this soil as cropland. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, basin wildrye, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by

mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Its moderate available water capacity restricts the choice of shrubs and trees to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The soft sedimentary beds at a depth of 20 to 40 inches limit this soil for most urban uses. Septic tank absorption fields require special design because of the soft sedimentary beds.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

103—Reeder loam, 4 to 8 percent slopes. This is a moderately deep, well drained, gently rolling soil on uplands. It formed in material that weathered from soft sedimentary beds. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark brown loam 7 inches thick. The subsoil is mostly dark brown clay loam 13 inches thick. The substratum is light brownish gray clay loam 8 inches thick. Soft sedimentary beds to a depth of 45 inches are light olive gray, soft siltstone that rubs to loam or silt loam. Below that, to a depth of 60 inches, the beds are light brownish gray sandstone that rubs to loamy fine sand or fine sandy loam.

Permeability is moderate, and the available water capacity is moderate. The effective rooting depth is about 28 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is medium. Water and wind erosion are moderate hazards. The depth to soft sedimentary beds ranges from 20 to 40 inches.

Included with this soil in mapping are a few small areas of Elloam, Cabba, Williams, and Vida soils and soils that formed in a thin mantle of glacial till over the sedimentary beds. The Elloam soil is in small, sparsely vegetated depressions. It is moderately affected by sodium. The undulating Cabba soil is on knolls and ridges. It is a shallow soil.

The Reeder soil is used for dryland crops and as rangeland. The main crops are wheat, oats, and barley. Wind erosion is a limitation to the use of this soil as cropland. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists of rough fescue, bluebunch

wheatgrass, green needlegrass, basin wildrye, and Idaho fescue. Sedges, forbs, and some woody plants are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. The moderate available water capacity restricts the choice of shrubs and trees to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The moderate depth to soft sedimentary beds limits this soil for most urban uses. Septic tank absorption fields require special design because of the sedimentary beds.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

104—Rubble land-Rock outcrop association. This association consists of very steep Rubble land and Rock outcrop on the side of mountains. Rubble land consists of large boulders and stones that have collected along the sides and at the base of ridges below areas of exposed bedrock. Rock outcrop is along the crest of ridges. There are taluses below the Rock outcrop. The elevation is 3,000 to 6,000 feet.

Rubble land makes up about 65 percent of this association, and Rock outcrop makes up 25 percent. Included in mapping are small areas of steep Castner and Belain soils. These soils make up about 10 percent of the association.

This association is suited to and is used for wildlife habitat, watershed, and recreation.

Capability class VIII, dryland.

105—Savage silty clay loam, 0 to 2 percent slopes.

This is a deep, well drained, nearly level soil that formed in alluvium on stream terraces and fans. The elevation is 2,500 to 4,000 feet. Slopes are mainly short. The average annual precipitation is 15 inches, and the

average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark grayish brown silty clay loam 6 inches thick. The subsoil is dark grayish brown silty clay and grayish brown silty clay loam 15 inches thick. The substratum, to a depth of 60 inches, is grayish brown silty clay loam.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard.

Included with this soil in mapping are a few small areas of Gerdrum, Farnuf, and Straw soils. The Gerdrum soil is nearly level; it is in small, sparsely vegetated depressions. It is moderately affected by sodium.

The Savage soil is used for dryland and irrigated crops and as rangeland. The main dryland crops are wheat, barley, and oats, and the main irrigated crops are alfalfa, wheat, barley, and corn. Wind erosion is the main limitation to the use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease and Idaho fescue, prairie junegrass, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and big sagebrush increase. Weedy plants likely to invade are Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. Forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a very serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, allows desirable native plants to become reestablished, and thus increases forage production.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderately slow permeability, high shrink-swell potential, and low soil strength limit this soil for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability.

Foundations and basements for houses require special design because of the high shrink-swell potential and low soil strength.

Capability subclass IIIe, dryland, and IIc, irrigated; Silty range site, 15- to 19-inch precipitation zone.

106—Savage silty clay loam, 2 to 4 percent slopes.

This is a deep, well drained, undulating soil that formed in alluvium on stream terraces and fans. The elevation is 2,500 to 4,000 feet. Slopes are mainly short. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark grayish brown silty clay loam 6 inches thick. The subsoil is dark grayish brown silty clay and grayish brown silty clay loam 15 inches thick. The substratum, to a depth of 60 inches, is grayish brown silty clay loam.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard.

Included with this soil in mapping are a few small areas of Gerdrum, Farnuf, and Straw soils. The gently sloping Gerdrum soil is in small, sparsely vegetated depressions. It is moderately affected by sodium.

The Savage soil is used for dryland and irrigated crops and as rangeland. The main dryland crops are wheat, barley, and oats, and the main irrigated crops are alfalfa, wheat, barley, and corn. Wind erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye and an increase of plants such as Idaho fescue, needleandthread, prairie junegrass, western wheatgrass, fringed sagewort, common snowberry, big sagebrush, Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. Forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a very serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, allows desirable native plants to become reestablished, and thus increases forage production.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderately slow permeability, high shrink-swell potential, and low strength limit this soil for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability. Foundations and basements for houses require special design because of the high shrink-swell potential and low soil strength.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

107—Savage-Gerdrum silty clay loams, 0 to 4 percent slopes. This complex consists of nearly level to gently sloping soils on stream terraces and fans on uplands. The elevation is 2,500 to 4,000 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Savage soil makes up about 65 percent of the map unit, and the Gerdrum soil makes up 20 percent. Included with these soils in mapping are small areas of Farnuf, Korent, and Straw soils. These soils make up about 15 percent of the map unit.

The Savage soil is deep and well drained. It formed in alluvium, and it is in smooth areas. Typically, the surface layer is dark grayish brown silty clay loam 6 inches thick. The subsoil is dark grayish brown silty clay and grayish brown silty clay loam 15 inches thick. The substratum, to a depth of 60 inches or more, is grayish brown silty clay loam.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Gerdrum soil is deep and well drained. It formed in alluvium in small, sparsely vegetated depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The upper part of the subsoil is mostly grayish brown clay 15 inches thick. The lower part is light brownish gray clay loam to a depth of 60 inches or more. The upper part of the substratum is grayish brown sandy clay loam 10 inches thick. The lower part is brown gravelly sandy loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is

a slight hazard. The subsoil is moderately affected by sodium. When dry, the subsoil is very hard, and it impedes the penetration of roots and moisture. If this soil is used for cultivated crops, the surface layer and upper part of the subsoil are mixed. This causes the surface to crust. The crust impedes seedling emergence, and thus crop yields are reduced.

In some areas the soils in this complex are used for dryland crops, mainly wheat, barley, and oats. Wind erosion on both soils and surface crusting on the Gerdrum soil are the main limitations to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. On the Gerdrum soil, applications of manure or other organic matter reduce surface crusting and increase crop yields.

These soils are suited to use as rangeland and are used mainly as rangeland. Most of the forage is produced on the Savage soil. The potential plant community on the Savage soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreaseers. The potential plant community on the Gerdrum soil consists of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, Nuttall saltbush, green needlegrass, and basin wildrye and an increase of needleandthread, prairie junegrass, inland saltgrass, fringed sagewort, shrubby cinquefoil, Kentucky bluegrass, foxtail barley, greasewood, pussytoes, plains pricklypear, and clubmoss.

On the Savage soil, the potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years. On the Gerdrum soil, forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a very serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, allows desirable native plants to become reestablished, and thus increases forage production.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. On the Savage soil, suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac. Because the Gerdrum soil is moderately affected by sodium, the choice of shrubs and

trees is restricted to those that are sodium resistant. On the Gerdrum soil, suitable trees include Russian-olive and Siberian elm, and suitable shrubs are Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The high shrink-swell potential, low soil strength, and moderately slow permeability of the Savage soil limit the soils in this complex for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability of the Savage soil, and foundations and basements for houses require special design because of the high shrink-swell potential and low soil strength.

Capability subclass IIIs, dryland. Savage soil is in Silty range site, 15- to 19-inch precipitation zone; Gerdrum soil is in Dense Clay range site, 15- to 19-inch precipitation zone.

108—Scobey clay loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to undulating soil that formed in glacial till on uplands. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer is grayish brown clay loam 6 inches thick. The upper part of the subsoil is brown clay 6 inches thick, and the lower part is grayish brown clay loam 7 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Elloam, Kevin, and Phillips soils are included with this soil in mapping. The nearly level Elloam soil is in depressions. It is moderately affected by sodium.

This Scobey soil is used for dryland and irrigated crops. It is also used as rangeland. The main dryland crops are wheat, barley, and oats; the main irrigated crops are wheat, barley, and alfalfa. Wind erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease; needleandthread, blue grama, and fringed sagewort increase; and annual grasses, broom snakeweed, and clubmoss are likely to invade. The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The low soil strength and slow permeability limit this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability. Basements and foundations need special design because of the low soil strength.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 10- to 14-inch precipitation zone.

109—Scobey-Kevin clay loams, 0 to 4 percent slopes. This complex consists of nearly level to undulating soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Scobey soil makes up about 55 percent of this map unit, and the Kevin soil makes up 35 percent. Included with these soils in mapping are small areas of Dimmick, Nishon, Elloam, Hillon, and Phillips soils. These soils make up about 10 percent of the map unit. Dimmick and Nishon soils are nearly level. They are in small enclosed basins that are subject to ponding. The Elloam soil is in small, sparsely vegetated depressions and is moderately affected by sodium. The Hillon soil is on knolls.

The Scobey soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is grayish brown clay loam 6 inches thick. The upper part of the subsoil is brown clay 6 inches thick, and the lower part is grayish brown clay loam 7 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Kevin soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The soils in this complex are used for dryland crops and as rangeland. The main dryland crops are wheat and barley. Wind erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

These soils are suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of needleandthread, prairie junegrass, blue grama, and fringed sagewort. Weedy plants likely to invade are annual grasses, broom snakeweed, and clubmoss. Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years for both the Scobey and Kevin soils.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

110—Scobey-Kevin clay loams, 4 to 8 percent slopes. This complex consists of gently rolling soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Scobey soil makes up about 45 percent of this map unit, and the Kevin soil makes up 40 percent. Included with these soils in mapping are small areas of Dimmick, Nishon, Elloam, Hillon, and Phillips soils. These

soils make up about 15 percent of the map unit. Dimmick and Nishon soils are nearly level; they are in basins and are subject to ponding. The Elloam soil is nearly level; it is in small, sparsely vegetated depressions and is moderately affected by sodium. The Hillon soil is on knolls.

The Scobey soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is grayish brown clay loam 6 inches thick. The upper part of the subsoil is brown clay 6 inches thick. The lower part is grayish brown clay loam 7 inches thick. The substratum is light brownish gray and grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Kevin soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

These soils are used for dryland crops and as rangeland. The main crops are wheat and barley. Wind erosion and water erosion are the main limitations to use of these soils for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

These soils are suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of needleandthread, threadleaf sedge, prairie junegrass, blue grama, fringed sagewort, annual grasses, broom snakeweed, and clubmoss. Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years for both the Scobey and Kevin soils.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

111—Shaak loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil on uplands. It formed in alluvium on terraces and fans. The elevation is 3,000 to 4,200 feet. Slopes are mainly long. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer, where it is mixed to a depth of about 6 inches, is mainly grayish brown loam. The subsoil is 22 inches thick. The upper part is brown clay, and the lower part is mainly grayish brown clay loam. The upper part of the substratum is brown gravelly sandy clay loam 14 inches thick, and the lower part is brown very gravelly sandy loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Gerdrum and Work soils are included with this soil in mapping. The nearly level Gerdrum soil is in small, sparsely vegetated depressions. It is moderately affected by sodium.

The Shaak soil is used mainly for dryland crops and as rangeland. The main crops are wheat, barley, and oats. Wind erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, and ponderosa pine. Sedges, forbs, and some woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, and green needlegrass decrease; Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil increase; and Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss invade. The potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a

spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

112—Shaak-Gerdrum complex, 0 to 4 percent slopes. This complex consists of nearly level to gently sloping soils on terraces and fans on uplands. The elevation is 3,000 to 4,200 feet. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Shaak soil makes up about 65 percent of this map unit, and the Gerdrum soil makes up 25 percent. Included with these soils in mapping are small areas of Work soil. This soil makes up about 10 percent of the map unit.

The Shaak soil is deep and well drained. It formed in alluvium in smooth areas throughout the survey area. Typically, the surface layer, where it is mixed to a depth of about 6 inches, is mostly grayish brown loam. The subsoil is 22 inches thick. The upper part is brown clay, and the lower part is grayish brown clay loam. The upper part of the substratum is brown gravelly sandy clay loam 14 inches thick. The lower part is brown, very gravelly sandy loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Gerdrum soil is deep and well drained. It formed in alluvium in small, sparsely vegetated depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The upper part of the subsoil is mostly grayish brown clay 15 inches thick. The lower part is light brownish gray clay loam 14 inches thick. The upper part of the substratum is grayish brown sandy clay loam 10 inches thick. The lower part is brown gravelly sandy loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60

inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil, which is moderately affected by sodium, is very hard when dry and thus impedes the penetration of roots and moisture. If this soil is cultivated, the surface layer and upper part of the subsoil are mixed. This causes the surface to crust. The crust impedes seedling emergence, and thus crop yields are reduced.

In some areas, the soils in this complex are used for dryland crops, mainly wheat, oats, and barley. Wind erosion on both soils and surface crusting on the Gerdrum soil are the main limitations to use of these soils for cultivated crops.

Stripcropping, tall grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion. Applications of manure or other organic matter reduce surface crusting and increase crop yields.

The soils in this complex are suited to use as rangeland and are used mainly as rangeland. Most of the forage is produced on the Shaak soil. The potential plant community on the Shaak soil consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. The potential plant community on the Gerdrum soil consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Sandberg bluegrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, Nuttall saltbush, and green needlegrass and an increase of Idaho fescue, big sagebrush, needleandthread, blue grama, prairie junegrass, inland saltgrass, fringed sagewort, and shrubby cinquefoil. Weedy plants likely to invade are Kentucky bluegrass, foxtail barley, greasewood, pussytoes, plains pricklypear, and clubmoss.

On the Shaak soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Gerdrum soil, forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. Because the Gerdrum soil is moderately affected by sodium, the choice of shrubs and trees is restricted to those that are

resistant to sodium. On the Shaak soil, suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac. On the Gerdrum soil, suitable trees include Russian-olive and Siberian elm, and suitable shrubs are Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The slow permeability of both soils and the high shrink-swell potential and low soil strength of the Gerdrum soil limit the soils in this complex for most urban uses. Septic tank absorption fields, for example, require special design because of these limitations. Basements and foundations for buildings on the Gerdrum soil need special design because of the high shrink-swell potential and the low soil strength.

Capability subclass IVs, dryland. Shaak soil is in Silty range site, 10- to 14-inch precipitation zone; Gerdrum soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

113—Shawmut gravelly loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil on uplands. It formed in alluvium on terraces and fans. The elevation is 2,800 to 4,000 feet. Slopes are mainly medium in length. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is dark brown gravelly loam 3 inches thick. The subsoil is mostly dark grayish brown gravelly clay loam and grayish brown very gravelly clay loam 12 inches thick. The substratum, to a depth of 60 inches is grayish brown very gravelly loam and extremely gravelly loam.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Farnuf, Turner, and Work soils are included with this soil in mapping.

This Shawmut soil is used for dryland and irrigated crops. It is also used as rangeland. The main dryland crops are wheat, barley, and oats. The main irrigated crop is alfalfa.

Droughtiness and wind erosion are the main limitations to use of this soil for cultivated crops. Because of droughtiness, successful crop production depends on proper distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall-grass barriers for trapping windblown snow help to conserve moisture. Stripcropping, tall-grass barriers, minimum tillage, and stubble mulch tillage help to control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue,

bluebunch wheatgrass, green needlegrass, basin wildrye, and ponderosa pine. Some sedges, forbs, and woody plants are decreasers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; Idaho fescue, needleandthread, western wheatgrass, prairie junegrass, fringed sagewort, common snowberry, and big sagebrush increase; and Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes invade. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Because of its low available water capacity the choice of shrubs and trees is restricted to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses.

Capability subclass IIIs, dryland, and IIle, irrigated; Silty range site, 15- to 19-inch precipitation zone.

114—Shawmut gravelly loam, 4 to 8 percent slopes. This is a deep, well drained, moderately sloping soil on uplands. It formed in alluvium on terraces and fans. The elevation is 2,800 to 4,000 feet. Slopes are mainly medium in length. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark brown gravelly loam 3 inches thick. The subsoil is mostly dark grayish brown gravelly clay loam and grayish brown very gravelly clay loam 12 inches thick. The substratum to a depth of 60 inches is grayish brown very gravelly loam and extremely gravelly loam.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is medium. Wind and water erosion are moderate hazards.

Small areas of Farnuf, Turner, and Work soils are included with this soil in mapping.

This soil is used mainly for dryland and irrigated crops. It is also used as rangeland. The main dryland crops are wheat, barley, and oats. The main irrigated crop is alfalfa.

Droughtiness and wind and water erosion are the main limitations to use of this soil for cultivated crops. Because of the droughtiness, successful crop production depends on a suitable distribution of rainfall during the growing season. Stubble mulch tillage, minimum tillage, and tall-grass barriers for trapping windblown snow help to conserve moisture. Stripcropping, tall-grass barriers,

minimum tillage, and stubble mulch tillage help to control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, basin wildrye, and ponderosa pine. Sedges, forbs, and some woody plants are decreaseers. If the rangeland is overgrazed, rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye decrease; Idaho fescue, needleandthread, western wheatgrass, prairie junegrass, fringed sagewort, common snowberry, and big sagebrush increase; and Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes invade. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Because of the low available water capacity, the choice of shrubs and trees is restricted to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry.

This soil is suited to most urban uses.

Capability subclass IVs, dryland, and IVs, irrigated; Silty range site, 15- to 19-inch precipitation zone.

115—Silverchief-Whitecow-Macmeal association, steep. This association consists of Silverchief soil, Whitecow soil on south-facing slopes, and Macmeal soil on north-facing slopes. The elevation is 4,000 to 6,000 feet. The average annual precipitation is 19 inches, and the average annual temperature is 40 degrees F. The average growing season is 90 days.

The Silverchief soil makes up about 35 percent of the map unit, the Whitecow soil makes up 30 percent, and the Macmeal soil makes up 25 percent. Included with these soils in mapping are small areas of Warneke soil and other deep loamy soils. These soils make up about 10 percent of the map unit.

The Silverchief soil is deep and well drained. It formed in colluvium or alluvium of igneous and sedimentary rocks on the lower part of mountain slopes and on fans. Typically, the surface layer is covered by an organic mat 3 inches thick. The surface layer is pale brown loam 5 inches thick. The subsoil is light olive brown clay and gravelly clay 22 inches thick. The substratum is brown, very gravelly sandy clay loam to a depth of 60 inches or more.

Permeability is moderately slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 48 inches. Runoff is medium. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Whitecow soil is deep and well drained. It formed in colluvium or alluvium of limestone on south- and west-facing slopes on mountainsides. Typically, the surface layer is covered by an organic mat 1 inch thick. The upper part of the surface layer is dark grayish brown gravelly loam 3 inches thick, and the lower part is grayish brown very gravelly loam 7 inches thick. The subsoil is light brownish gray very gravelly loam 10 inches thick. The substratum is light brownish gray extremely gravelly loam to a depth of 60 inches or more.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Macmeal soil is deep and well drained. It formed in material that weathered from igneous and metamorphic rock on north- and east-facing slopes on mountainsides. Typically, the surface layer is covered by an organic mat 2 inches thick. The surface layer is pale brown gravelly loam 7 inches thick. The upper part of the subsoil is yellowish brown very gravelly clay loam 7 inches thick. The middle part is yellowish brown, extremely channery clay loam 34 inches thick. The lower part is brown, extremely flaggy clay loam to a depth of 60 inches.

Permeability is moderately slow, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

In 1936, a forest fire burned most of the trees in the Little Rocky Mountains. A few scattered stands of Douglas-fir, lodgepole pine, and ponderosa pine survived and provided a source of seed for the regeneration of trees. Grasses and shrubs cover most of the area and protect the soils from erosion. Because grasses and shrubs are strong competitors for moisture and nutrients, they have delayed the reestablishment of trees in most parts of the Little Rocky Mountains.

The soils in this association are suited to use as rangeland. Most of the forage is produced on the soils on north- and east-facing slopes.

The potential plant community on the soils on north- and east-facing slopes consists mainly of rough fescue, green needlegrass, bluebunch wheatgrass, Saskatoon serviceberry, Idaho fescue, Oregon grape, and common snowberry. The potential plant community on the soils on south- and west-facing slopes consists mainly of rough fescue, little bluestem, green needlegrass, bluebunch wheatgrass, western wheatgrass, prairie junegrass, and needleandthread. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, green needlegrass, and little bluestem and an increase of plants such as Idaho fescue, common snowberry, prairie junegrass,

needleandthread, Kentucky bluegrass, Canada thistle, timothy, annual grasses, and forbs.

The soils in this association are suited to woodland use. The Silverchief and Macmeal soils, on north- and east-facing slopes, are suited to Douglas-fir and lodgepole pine. The Silverchief soil is capable of producing about 5,020 cubic feet, or 15,080 board feet (Scribner rule), per acre of Douglas-fir and 7,860 cubic feet, or 22,000 board feet (Scribner rule), per acre of lodgepole pine. The Macmeal soil is capable of producing about 4,495 cubic feet, or 11,510 board feet (Scribner rule), per acre of Douglas-fir and 6,500 cubic feet, or 17,000 board feet (Scribner rule), per acre of lodgepole pine. The Whitecow soil, on south- and west-facing slopes, is suited to ponderosa pine. This soil is capable of producing about 3,900 cubic feet, or 7,800 board feet (Scribner rule), per acre of ponderosa pine. These production levels are from fully stocked, even-aged, unmanaged stands of 100-year-old trees.

There are limitations to the use of these soils for timber production. The Silverchief soil, for example, is strongly sloping to steep and has clay in the subsoil. The Whitecow and Macmeal soils are steep and very steep and have a low available water capacity. The clay in the subsoil of the Silverchief soil restricts the use of logging equipment in wet seasons. Because the Whitecow and Macmeal soils are on hot, dry, south-facing slopes and have a low available water capacity, regeneration of trees is limited and seedling mortality is high. To reduce plant competition and seedling mortality, site scarification during harvest and regeneration work are necessary in areas of all three soils. To prevent excessive erosion, logs should not be skidded in drainageways, and to prevent deeply rutted paths from forming, numerous trails should be used in skidding logs.

The soils in this association are not suitable for windbreaks because slopes are greater than 15 percent.

Steep slopes limit these soils for most urban uses. The moderately slow permeability of the Silverchief and Macmeal soils is an additional limitation. Septic tank absorption fields require special design because of the moderately slow permeability.

Silverchief soil is in capability subclass VIe, dryland; Whitecow and Macmeal soils are in capability subclass VIIe, dryland.

116—Straw-Korent loams. This complex consists of nearly level soils on flood plains and stream terraces. The elevation is 2,600 to 4,000 feet. Slopes are 0 to 2 percent. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Straw soil makes up about 45 percent of this map unit, and the Korent soils makes up 40 percent. Included with these soils in mapping are small areas of Farnuf and Nesda soils. These soils make up about 15 percent of the map unit. The nearly level Nesda soil is on the edge of stream terraces.

The Straw soil is deep and well drained. It formed in alluvium in areas not identified by unique landscape features. Typically, the upper part of the surface layer is dark grayish brown loam 7 inches thick, and the lower part is dark grayish brown silt loam 14 inches thick. There are thin strata of fine sandy loam in the lower part. The substratum to a depth of 60 inches is grayish brown loam stratified with sandy loam and silty clay loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is subject to rare flooding.

The Korent soil is deep and well drained. It formed in alluvium in areas not identified by unique landscape features. Typically, the surface layer is dark grayish brown loam 7 inches thick. The upper part of the substratum is brown silt loam 7 inches thick. Below that, the substratum is grayish brown sandy clay loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is subject to rare flooding.

The soils in this complex are used for dryland and irrigated crops. They are also used as rangeland. The main dryland crops are wheat, barley, and oats, and the main irrigated crops are wheat, barley, alfalfa, and corn. Wind erosion is the main limitation to the use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage and tillage that utilizes crop residue can effectively control wind erosion.

These soils are suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decrease. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of such plants as Idaho fescue, needleandthread, prairie junegrass, western wheatgrass, fringed sagewort, common snowberry, big sagebrush, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. Forage production on the Straw and Korent soils is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The main limitation to the use of these soils for urban development is the fact that they may be flooded.

Capability subclass IIle, dryland, and IIe, irrigated; Silty range site, 15- to 19-inch precipitation zone.

117—Straw-Korent loams, occasionally flooded.

This complex consists of nearly level soils on low stream terraces and flood plains. The elevation is 2,600 to 4,000 feet. Slopes are 0 to 2 percent. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Straw soil makes up about 40 percent of this map unit, and the Korent soil makes up 40 percent. Included with these soils in mapping are small areas of Nesda soil and other moderately well drained or somewhat poorly drained loam and clay loam soils. These soils make up about 20 percent of the map unit. The nearly level Nesda soil is on the edge of terraces. The moderately well drained or somewhat poorly drained loam and clay loam soils are in lower areas adjacent to stream channels.

The Straw soil is deep and well drained. It formed in alluvium in areas not identified by unique landscape features. Typically, the upper part of the surface layer is dark grayish brown loam 7 inches thick, and the lower part is dark grayish brown silt loam 14 inches thick. There are thin strata of fine sandy loam in the lower part. The substratum to a depth of 60 inches or more is grayish brown loam; it has thin strata of sandy loam and silty clay loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind and water erosion are moderate hazards. This soil is subject to occasional flooding in spring.

The Korent soil is deep and well drained. It formed in alluvium in areas not identified by unique landscape features. Typically, the surface layer is dark grayish brown loam 7 inches thick. The upper part of the substratum is brown silt loam 7 inches thick, and the lower part is grayish brown sandy clay loam to a depth of 60 inches or more.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind and water erosion are moderate hazards. This soil is subject to occasional flooding in spring.

The soils in this complex are used mainly for irrigated alfalfa and as rangeland. Occasional flooding is the main limitation to the use of these soils for cultivated crops.

These soils are suited to use as rangeland. The potential plant community consists mainly of basin wildrye, prairie cordgrass, tall sedges, and tufted hairgrass. Forbs and some woody plants are decreasers. If the rangeland is overgrazed, basin wildrye, prairie cordgrass, and tufted hairgrass decrease and western wheatgrass, Baltic rush, and shrubby cinquefoil increase.

Weedy plants that are likely to invade are foxtail barley and Kentucky bluegrass. The potential plant community on the Straw and Korent soils produces 2,000 pounds of forage per acre in favorable years and 1,200 pounds per acre in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and cottonwood. Suitable shrubs include common chokecherry, American plum, silver buffaloberry, lilac, skunkbush sumac, and sandcherry.

Occasional flooding imposes serious limitations to the use of these soils for urban development.

Capability subclass IIIw, dryland, and IIIw, irrigated; Overflow range site, 15- to 19-inch precipitation zone.

118—Straw and Nesda soils, channeled. This map unit consists of nearly level, deep, well drained soils on bottom lands and low stream terraces. The elevation is 2,600 to 4,000 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 115 days.

Included with these soils in mapping are small areas of Korent soils, some wet or wet and saline soils, and some very gravelly soils. These soils are subject to occasional flooding and to streambank erosion.

Typically, in the Straw soil, the upper part of the surface layer is dark grayish brown loam 7 inches thick, and the lower part is dark grayish brown silt loam 14 inches thick. There are thin strata of fine sandy loam in the lower part. The substratum to a depth of 60 inches is grayish brown loam; it has thin strata of sandy loam and silty clay loam.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard except where there is channeling and streambank erosion. The soil is subject to occasional flooding during spring.

Typically, in the Nesda soil, the upper part of the surface layer is grayish brown loam 7 inches thick, and the lower part is brown sandy loam 4 inches thick. The upper part of the substratum is grayish brown, very gravelly loamy sand 4 inches thick, and the lower part is very gravelly sand to a depth of 60 inches or more.

Permeability is moderate to a depth of about 11 inches and very rapid below a depth of 11 inches. The available water capacity is low or very low. The effective rooting depth is about 60 inches. The average annual wetting depth under native vegetation is 40 inches. Runoff is slow. Wind and water erosion are moderate hazards. Very gravelly sand at a depth of less than 20 inches causes this soil to be droughty. This soil is subject to occasional flooding in spring.

The Straw and Nesda soils are very poorly suited to use as cropland because they are dissected by numerous channels.

These soils are suited to use as rangeland and are used as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, green needlegrass, and basin wildrye and an increase of plants such as fringed sagewort, needleandthread, blue grama, common snowberry, and big sagebrush. Weedy plants that are likely to invade are Kentucky bluegrass, broom snakeweed, annual grasses, and Hood phlox. Forage production is 2,000 pounds per acre in favorable years and 1,200 pounds per acre in unfavorable years.

These soils are not suitable for windbreaks because they are dissected by numerous stream channels.

Occasional flooding imposes serious limitations to the use of these soils for urban development.

Capability subclass Vlw, dryland; Overflow range site, 15- to 19-inch precipitation zone.

119—Telstad loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to undulating soil that formed in glacial till on glaciated uplands. The elevation is 2,400 to 3,600 feet. Slopes are mainly long. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is brown loam 7 inches thick. The subsoil is brown and pale brown clay loam 11 inches thick. The upper part of the substratum is light brownish gray clay loam 27 inches thick. The lower part is light yellowish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Assinniboine, Joplin, and Nishon soils are included with this soil in mapping. The Nishon soil is level or nearly level. It is in small enclosed basins that are subject to ponding.

The Telstad soil is used for dryland crops and irrigated alfalfa. It is also used as rangeland. The main dryland crops are wheat, barley, and oats. Wind erosion is the main limitation to use of this soil for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. If the rangeland is overgrazed,

western wheatgrass and green needlegrass decrease and needleandthread, prairie junegrass, threadleaf sedge, blue grama, and fringed sagewort increase. Weedy plants that are likely to invade are annual grasses, broom snakeweed, and clubmoss. Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass Ille, dryland, and Ile, irrigated; Silty range site, 10- to 14-inch precipitation zone.

120—Telstad-Joplin loams, 0 to 4 percent slopes.

This complex consists of nearly level to undulating Telstad soil and undulating Joplin soil on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Telstad soil makes up about 55 percent of this map unit, and the Joplin soil makes up 30 percent. Included with these soils in mapping are small areas of Assinniboine, Attewan, Wabek, and Nishon soils. These soils make up about 15 percent of the map unit. The undulating Assinniboine soil is on the upper part of slopes. The nearly level to undulating Wabek soil is on small terraces. The level to nearly level Nishon soil is in basins, and it is subject to ponding.

The Telstad soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is brown loam 7 inches thick. The subsoil is brown and pale brown clay loam 11 inches thick. The upper part of the substratum is light brownish gray clay loam 27 inches thick. The lower part is light yellowish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Joplin soil is deep and well drained. It formed in glacial till on ridges, knolls, and the upper part of slopes. Typically, the surface layer is grayish brown loam 6 inches thick. The upper part of the subsoil is dark brown clay loam 3 inches thick. The lower part is grayish brown loam 7 inches thick. The substratum is grayish brown loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The soils in this complex are used for dryland crops and irrigated alfalfa. In some areas, they are used as rangeland. The main dryland crops are wheat, barley, and oats.

Wind erosion is the main limitation to use of these soils for cultivated crops. Effective in controlling wind erosion are stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue.

The soils in this complex are suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of plants such as needleandthread, blue grama, fringed sagewort, annual grasses, broom snakeweed, and clubmoss.

Forage production on the Telstad and Joplin soils is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a very serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; and thus forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland, and IIe, irrigated; Silty range site, 10- to 14-inch precipitation zone.

121—Telstad-Joplin loams, 4 to 8 percent slopes.

This complex consists of gently rolling soils on glaciated

uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Telstad soil makes up about 45 percent of the map unit, and the Joplin soil makes up 40 percent. Included with these soils in mapping are small areas of Assinniboine, Hillon, Nishon, and Wabek soils. These soils make up about 15 percent of the map unit. The gently rolling Assinniboine soil is on the upper part of slopes. The Hillon soil is on the top of knolls and ridges. The Nishon soil is in small enclosed basins that are subject to ponding. The gently rolling Wabek soil is on the upper part of slopes.

The Telstad soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is brown loam 7 inches thick. The subsoil is brown and pale brown clay loam 11 inches thick. The upper part of the substratum is light brownish gray clay loam 27 inches thick. The lower part is light yellowish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Joplin soil is deep and well drained. It formed in glacial till on ridges, knolls, and the upper part of slopes. Typically, the surface layer is grayish brown loam 6 inches thick. The upper part of the subsoil is dark brown clay loam 3 inches thick. The lower part is grayish brown loam 7 inches thick. The substratum is grayish brown loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The soils in this complex are used for dryland crops and as rangeland. The main dryland crops are wheat, barley, and oats.

Wind and water erosion are the main limitations to use of these soils for cultivated crops. Effective in controlling wind and water erosion are stripcropping, tall-grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways.

These soils are suited to use as rangeland. The potential plant community consists of mainly western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. If the rangeland is overgrazed, western wheatgrass and green needlegrass decrease and needleandthread, prairie junegrass, threadleaf sedge, blue grama, and fringed sagewort increase. Weedy plants likely to invade are annual grasses, broom snakeweed, and clubmoss.

Forage production on the Telstad and Joplin soils is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

122—Telstad-Joplin gravelly loams, 0 to 4 percent slopes. This complex consists of nearly level to undulating soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Telstad soil makes up about 45 percent of this map unit, and the Joplin soil makes up 40 percent. Included with these soils in mapping are small areas of Assiniboine, Attewan, and Wabek soils. These soils make up about 15 percent of the map unit. The undulating Assiniboine soil is on the upper part of slopes. The nearly level and undulating Wabek soil is on small terraces.

The Telstad soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer is grayish brown gravelly loam 7 inches thick. The subsoil is mostly grayish brown and pale brown clay loam 11 inches thick. The substratum is light brownish gray clay loam and light yellowish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Joplin soil is deep and well drained. It formed in glacial till on ridges, knolls, and the upper part of slopes. Typically, the surface layer is grayish brown gravelly loam 6 inches thick. The upper part of the subsoil is dark brown clay loam 3 inches thick, and the lower part is grayish brown loam 7 inches thick. The substratum is grayish brown loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches.

The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The soils in this complex are used for dryland crops and as rangeland. The main dryland crops are wheat, barley, and oats.

Wind erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue are effective in controlling wind erosion.

These soils are suited to use as rangeland. The potential plant community on the Telstad and Joplin soils consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of plants such as needleandthread, blue grama, fringed sagewort, annual grasses, broom snakeweed, and clubmoss. Forage production on the Telstad and Joplin soils is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a very serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

The soils in this complex can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 10- to 14-inch precipitation zone.

123—Thoeny-Elloam complex, 0 to 4 percent slopes. This complex consists of nearly level to undulating soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Thoeny soil makes up about 60 percent of the map unit, and the Elloam soil makes up 30 percent. Included with these soils in mapping are small areas of Kevin, Nobe, and Phillips soils. These soils make up about 10 percent of the map unit. The Nobe soil is in small, nearly barren depressions.

The Thoeny soil is deep and well drained. It formed in glacial till, and it is in smooth areas. Typically, the upper part of the surface layer is pale brown loam 3 inches thick. The lower part is light brownish gray loam 3 inches thick. The upper part of the subsoil is brown clay 6 inches thick. The lower part is grayish brown clay loam 16 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil of the Thoeny soil is slightly affected by sodium at a depth of about 6 inches; consequently, crop yields are reduced.

The Elloam soil is deep and well drained. It formed in glacial till in small, sparsely vegetated depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is light brownish gray clay loam. The subsoil is grayish brown clay loam 10 inches thick. The substratum is mostly grayish brown clay loam to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. The subsoil of the Elloam soil is moderately affected by sodium, and the surface is subject to crusting; consequently, the emergence of seedlings is impeded and crop yields are reduced. Applications of manure or other organic matter help reduce surface crusting.

The soils in this complex are used mainly as rangeland. In some areas the soils are used for dryland crops, mainly wheat, barley, and oats. Wind erosion is the main limitation to use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

These soils are suited to use as rangeland. Most of the forage is produced on the Thoeny soil. The potential plant community on the Thoeny soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. On the Elloam soil it consists of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needlegrass, and Nuttall saltbush and an increase of needleandthread, blue grama, fringed sagewort, prairie junegrass, annual grasses, broom snakeweed, plains pricklypear, and clubmoss.

On the Thoeny soil, the potential plant community produces 1,500 pounds of forage per acre in favorable years and 800 pounds per acre in unfavorable years. On the Elloam soil, forage production is 800 pounds per

acre in favorable years and 300 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. Because the subsoil of the Thoeny soil is slightly affected by sodium and that of the Elloam soil is moderately affected, the choice of shrubs and trees is restricted to those that are resistant to sodium. Suitable trees include Russian-olive and Siberian elm, and suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry.

The very slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the very slow permeability.

Capability subclass IVe, dryland. Thoeny soil is in Silty range site, 10- to 14-inch precipitation zone; Elloam soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

124—Thoeny-Kevin-Elloam complex, 4 to 8 percent slopes. This complex consists of gently rolling soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Thoeny soil makes up about 35 percent of this map unit, and the Kevin soil and the Elloam soil each make up about 25 percent. Included with these soils in mapping are small areas of Phillips soil. This soil makes up about 15 percent of the map unit.

The Thoeny soil is deep and well drained. It formed in glacial till, and it is on the smoother part of slopes. Typically, the upper part of the surface layer is pale brown loam 3 inches thick, and the lower part is light gray loam 3 inches thick. The upper part of the subsoil is brown clay 6 inches thick. The lower part is grayish brown clay loam 16 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 28 inches. Runoff is medium. Wind and water erosion are moderate hazards. The subsoil of the Thoeny soil is slightly affected by sodium at a depth of about 6 inches; consequently, crop yields are reduced.

The Kevin soil is deep and well drained. It formed in glacial till on the upper part of ridges and knolls. Typically, the surface layer, where it is mixed to a depth

of about 7 inches, is grayish brown clay loam. The subsoil is grayish brown clay loam 9 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Elloam soil is deep and well drained. It formed in glacial till in small, sparsely vegetated depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is light brownish gray clay loam. The subsoil is grayish brown clay loam 10 inches thick. The substratum is mostly grayish brown clay loam to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is moderate. The effective rooting depth of the soil under native vegetation is 28 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The subsoil of the Elloam soil is moderately affected by sodium and the surface is subject to crusting; consequently, seedling emergence is impeded and crop yields are reduced. Applications of manure or other organic matter help reduce surface crusting.

In some areas the soils in this complex are used for dryland crops, mainly wheat, barley, and oats. Wind and water erosion are the main limitations to use of these soils for cultivated crops. Stripcropping, tall-grass barriers, minimum tillage, and stubble mulch tillage can effectively control wind and water erosion.

The soils in this complex are suited to use as rangeland and are used mainly as rangeland. Most of the forage is produced on the Thoeny and Kevin soils. The potential plant community on the Thoeny and Kevin soils consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs; on the Elloam soil it consists of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, greaseweed, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needlegrass, and Nuttall saltbush and an increase of needleandthread, blue grama, fringed sagewort, prairie junegrass, annual grasses, broom snakeweed, plains pricklypear, and clubmoss.

On the Thoeny and Kevin soils, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Elloam soil, forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows

desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. Because the subsoil of the Thoeny soil is slightly affected by sodium and the subsoil of the Elloam soil is moderately affected by sodium, the choice of shrubs and trees is restricted to those that are resistant to sodium. Suitable trees for the Thoeny and Elloam soils include Russian-olive and Siberian elm, and suitable shrubs include Siberian peashrub, skunkbush sumac, and silver buffaloberry. Suitable trees for the Kevin soil are Russian-olive, Siberian elm, green ash, ponderosa pine, and Rocky Mountain juniper, and suitable shrubs are Siberian peashrub, common chokecherry, and lilac.

The very slow permeability of the Thoeny and Elloam soils and the slow permeability of the Kevin soil limit these soils for most urban uses. Septic tank absorption fields require special design because of the very slow and slow permeability.

Capability subclass IVe, dryland. Thoeny and Kevin soils are in Silty range site, 10- to 14-inch precipitation zone; Elloam soil is in Dense Clay range site, 10- to 14-inch precipitation zone.

125—Turner loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil that formed in alluvium on fans and terraces on uplands. The elevation is 2,800 to 4,200 feet. Slopes are mainly long. The average annual precipitation is 15 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil, where it is mixed to a depth of about 4 inches, is dark grayish brown loam. The upper part of the subsoil is dark grayish brown and dark brown clay loam 3 inches thick. The lower part is brown sandy clay loam 4 inches thick. The upper part of the substratum is light gray clay loam 5 inches thick, and the middle part is light gray gravelly sandy clay loam 10 inches thick. The lower part of the substratum, to a depth of 60 inches, is grayish brown very gravelly loamy coarse sand.

Permeability is moderate to a depth of about 26 inches and rapid below that depth. The available water capacity is low or moderate. The effective rooting depth is about 30 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Beaverton, Martinsdale, and Work soils are included with this soil in mapping. The nearly level and gently sloping Beaverton soil is on the top of knolls and ridges.

This Turner soil is used as rangeland and for dryland crops and irrigated alfalfa for hay. The main dryland crops are wheat, oats, and barley.

Wind erosion is the main limitation to the use of this soil for cultivated crops. Stripcropping, tall-grass barriers,

field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, Idaho fescue, and ponderosa pine. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil. Weedy plants likely to invade are clubmoss, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. The potential heavy infestation by clubmoss is a very serious problem. Forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Its low to moderate available water capacity restricts the choice of shrubs and trees to those that are drought resistant. Suitable trees include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and sandcherry.

This soil is suited to most urban uses. Underground water supplies can be polluted by liquid and solid waste disposal systems because of the rapid permeability of the substratum.

Capability subclass IIIs, dryland, and IIs, irrigated; Silty range site, 15- to 19-inch precipitation zone.

126—Turner-Beaverton complex, 2 to 8 percent slopes. This complex consists of undulating to gently rolling soils on terraces and fans on uplands. The elevation is 2,800 to 4,200 feet. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Turner soil makes up about 50 percent of this map unit, and the Beaverton soil makes up 35 percent. Included with these soils in mapping are small areas of Martinsdale and Wabek soils. These soils make up about 15 percent of the map unit. The Wabek soil is on knolls and on the edge of terraces.

The Turner soil is deep and well drained. It formed in alluvium on the lower part of slopes. Typically, the surface layer, where it is mixed to a depth of about 4 inches, is dark grayish brown loam. The upper part of the subsoil is dark grayish brown and dark brown clay loam 3 inches thick. The lower part is brown sandy clay loam 4 inches thick. The upper part of the substratum is light gray clay loam 5 inches thick, and the middle part is light gray gravelly sandy clay loam 10 inches thick. The lower

part of the substratum, to a depth of 60 inches, is mostly grayish brown very gravelly loamy coarse sand.

Permeability is moderate to a depth of about 26 inches and rapid below that depth. The available water capacity is low or moderate. The effective rooting depth is about 30 inches. The average annual wetting depth of the soil under native vegetation is 26 inches. Runoff is slow. Wind and water erosion are moderate hazards. Very gravelly loamy coarse sand is at a depth of about 26 inches.

The Beaverton soil is deep and well drained. It formed in alluvium on fans and terraces. Typically, the surface layer is dark grayish brown gravelly loam 3 inches thick. The subsoil is dark brown gravelly clay loam 7 inches thick. The upper part of the substratum is light gray very gravelly clay loam 6 inches thick. Below that, to a depth of 60 inches, the substratum is grayish brown very gravelly loamy sand.

Permeability is moderate to a depth of about 20 inches and very rapid or rapid below that depth. The available water capacity is low. The effective rooting depth is about 20 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. Very gravelly loamy sand is at a depth of about 20 inches; consequently, this soil is too droughty for dryland crops.

In some small areas, these soils are used for dryland crops, mainly wheat, barley, and oats. Wind erosion and droughtiness are the main limitations to use of these soils for cultivated crops. Effective in controlling wind erosion are strip cropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue.

The soils in this complex are suited to use as rangeland and are used mainly as rangeland. Most of the forage is produced on the Turner soil. The potential plant community on the Turner soil consists mainly of rough fescue, bluebunch wheatgrass, and green needlegrass. Sedges, forbs, and some woody plants are decreasers. The potential plant community on the Beaverton soil consists mainly of bluebunch wheatgrass, green needlegrass, needleandthread, and western wheatgrass. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of threadleaf sedge, needleandthread, western wheatgrass, blue grama, fringed sagewort, Kentucky bluegrass, timothy, annual grasses, red threeawn, broom snakeweed, and Hood phlox.

On the Turner soil, forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Beaverton soil, forage production is 900 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Because the Turner soil has low or moderate available water capacity and the Beaverton soil has low available water capacity, the choice of shrubs and trees is restricted to those that are drought resistant. Suitable trees on the Turner soil include Russian-olive, Siberian crabapple, green ash, Siberian elm, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, and silver buffaloberry. Suitable trees on the Beaverton soil include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

These soils are suited to most urban uses. Underground water supplies can be polluted by liquid and solid waste from sanitary disposal systems because of the rapid permeability of the substratum.

Capability subclass IVe, dryland. Turner soil is in Silty range site, 15- to 19-inch precipitation zone; Beaverton soil is in Shallow to Gravel range site, 15- to 19-inch precipitation zone.

127—Twilight-Riedel fine sandy loams, 4 to 8 percent slopes. This complex consists of gently rolling soils on uplands. The elevation is 2,800 to 4,000 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Twilight soil makes up about 50 percent of this map unit, and the Riedel soil makes up 35 percent. Included with these soils in mapping are small areas of Cabbart, Chinook, and Delpoint soils. These soils make up about 15 percent of the map unit.

The Twilight soil is moderately deep and well drained. It formed on the lower slopes and swales in material that weathered from soft sandstone. Typically, the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is brown fine sandy loam 8 inches thick. The substratum is pale olive fine sandy loam 24 inches thick. Below that, there is soft sandstone to a depth of 60 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 35 inches. The average annual wetting depth of the soil under native vegetation is 35 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a moderate hazard. Soft sandstone is at a depth of 20 to 40 inches.

The Riedel soil is moderately deep and well drained. It formed on the upper slopes of ridges and knolls in material that weathered from soft sandstone. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The upper part of the substratum is light yellowish brown fine sandy loam 12 inches thick. The lower part, which is 7 inches thick, is strongly weathered sandstone that contains roots. Below that, to a depth of 60 inches, the substratum is sandstone.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 24 inches. The average annual wetting depth of the soil under native vegetation is 24 inches. Runoff is slow. Wind erosion is a severe hazard, and water erosion is a slight hazard. Strongly weathered sandstone is at a depth of 10 to 20 inches; soft sandstone is at a depth of 20 to 40 inches.

In some small areas, the soils in this complex are used for dryland crops, including wheat, barley, and oats. Wind and water erosion and droughtiness are the main limitations to use of these soils for cultivated crops. Effective in controlling wind and water erosion are strip cropping, tall-grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour strip cropping, and grassed waterways. A permanent and adequately maintained cover of planted grasses or of natural vegetation also helps control erosion.

These soils are suited to use as rangeland and are used mostly as rangeland. Most of the forage is produced on the Twilight soil. The potential plant community on the Twilight soil consists mainly of Indian ricegrass, prairie sandreed, needleandthread, western wheatgrass, and bluebunch wheatgrass. The potential plant community on the Riedel soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass, western wheatgrass, Indian ricegrass, and prairie sandreed and an increase of plants such as blue grama, threadleaf sedge, annual grasses, prairie junegrass, fringed sage, yucca, broom snakeweed, clubmoss, and plains pricklypear.

On the Twilight soil, forage production is 1,600 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Riedel soil, forage production is 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

The Twilight soil can be used for windbreaks. The very low available water capacity of the Riedel soil makes it unsuitable for windbreaks. Suitable trees on the Twilight soil include Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The soft sandstone at a depth of 20 to 40 inches limits these soils for most urban uses. Septic tank absorption fields require special design because of the soft sandstone.

Capability subclass IVe, dryland. Twilight soil is in Sandy range site, 10- to 14-inch precipitation zone; Riedel soil is in Shallow range site, 10- to 14-inch precipitation zone.

128—Twilight-Riedel fine sandy loams, 8 to 20 percent slopes. This complex consists of strongly rolling to hilly soils on uplands. The elevation is 2,800 to 4,000 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Twilight soil makes up about 40 percent of this map unit, and the Riedel soil makes up 40 percent. Included with these soils in mapping, and making up about 20 percent of the map unit, are small areas of Cabbart and Chinook soils and areas of Rock outcrop.

The Twilight soil is moderately deep and well drained. It formed on lower slopes and swales in material that weathered from soft sandstone. Typically, the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is brown fine sandy loam 8 inches thick. The substratum is pale olive fine sandy loam 24 inches thick. Below that, there is soft sandstone to a depth of 60 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 35 inches. The average annual wetting depth of the soil under native vegetation is 35 inches. Runoff is medium. Wind erosion is a severe hazard, and water erosion is a moderate hazard. Soft sandstone is at a depth of 20 to 40 inches.

The Riedel soil is moderately deep and well drained. It formed on the upper slopes of ridges, hills, and knolls in material that weathered from soft sandstone. Typically, the surface layer is grayish brown fine sandy loam 5 inches thick. The upper part of the substratum is light yellowish brown fine sandy loam 12 inches thick. The lower part, which is 7 inches thick, is strongly weathered sandstone that contains roots. Below that, to a depth of 60 inches, the substratum is soft sandstone.

Permeability is moderately rapid, and the available water capacity is very low. The effective rooting depth is about 24 inches. The average annual wetting depth of the soil under native vegetation is 24 inches. Runoff is medium. Wind erosion is a severe hazard, and water erosion is a moderate hazard. Strongly weathered sandstone is at a depth of 10 to 20 inches; soft sandstone is at a depth of 20 to 40 inches.

The soils in this complex are not suited to cultivated crops because of the very low available water capacity of the Riedel soil.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Twilight soil. The potential plant community on the Twilight soil consists mainly of Indian ricegrass, prairie sandreed, needleandthread, western wheatgrass, and bluebunch wheatgrass. The potential plant community on the Riedel soil consists mainly of bluebunch wheatgrass, western wheatgrass, needleandthread, prairie sandreed, and plains muhly. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass, western wheatgrass, Indian ricegrass, and prairie sandreed and an increase of plants such as blue

grama, annual grasses, threadleaf sedge, prairie junegrass, fringed sagewort, broom snakeweed, yucca, clubmoss, and plains pricklypear.

On the Twilight soil, forage production is 1,600 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. On the Riedel soil, forage production is 800 pounds per acre in favorable years and 400 pounds per acre in unfavorable years.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The Twilight soil can be used for windbreaks. The very low available water capacity of the Riedel soil makes it unsuited to windbreaks. Suitable trees on the Twilight soil are Russian-olive, Siberian crabapple, Siberian elm, ponderosa pine, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, silver buffaloberry, and sandcherry.

The soils in this complex are poorly suited to timber production. There are, however, some ponderosa pine and juniper trees.

The soft sandstone at a depth of 20 to 40 inches and the steepness of the slopes limit these soils for most urban uses. Septic tank absorption fields require special design because of the slopes and the soft sandstone.

Capability subclass Vle, dryland. Twilight soil is in Sandy range site, 10- to 14-inch precipitation zone; Riedel soil is in Shallow range site, 10- to 14-inch precipitation zone.

129—Typic Fluvaquents, 0 to 2 percent slopes.

This map unit consists of nearly level soils on bottom lands and flood plains mainly in the Milk River Valley. These soils in most places are deep, somewhat poorly drained or poorly drained silty clay loams and silty clays that formed in alluvium. They have a high seasonal water table, usually in the irrigation season. The landscape consists mainly of low areas, sloughs, and areas below irrigation canals. The elevation is 2,300 to 2,500 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The available water capacity is moderate or high. Runoff is slow. Water erosion is a slight hazard.

Included in mapping are small areas of moderately well drained soils.

Typic Fluvaquents are not suited to cultivated crops because of wetness and the hazard of flooding.

These soils are suited to use as rangeland and are used as rangeland. They are also suited to use as wildlife habitat.

The potential plant community consists mainly of sedges and rushes. Excessive grazing results in a decrease of desirable plants and an increase of plants such as Baltic rush and cattails. Weedy plants that are likely to invade with continued grazing pressure are foxtail barley, sunflowers, and dandelions. The potential plant community produces 5,000 pounds of forage per acre in favorable years and 3,000 pounds per acre in unfavorable years. If feasible, sealing irrigation canals and providing a well designed drainage system lowers

the water table and provides a more favorable site for desirable plants.

The soils in this unit are not suited to windbreaks because of wetness. Flooding and wetness seriously limit these soils for most urban uses.

Capability subclass Vw, irrigated; Wetland range site, 10- to 14-inch precipitation zone.

130—Typic Ustifluvents, wet. This map unit consists of nearly level to gently sloping soils on bottom lands and stream terraces in narrow valleys and drainageways. In small areas the soils are on multilevel terraces and short, steep slopes. These soils in most places are deep and moderately well drained or somewhat poorly drained loams and clay loams that formed in alluvium. They are subject to flooding in periods of high seasonal runoff, and in the lower areas they have a high seasonal water table. The landscape is dissected by stream channels and drainageways. The elevation is 2,600 to 5,000 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 115 days.

The available water capacity is high. Runoff is slow or medium. Wind and water erosion are moderate hazards.

Included in mapping are small areas of well drained loam and clay loam soils and soils that are underlain by very gravelly material at a depth of 10 to 40 inches.

Typic Ustifluvents are not suited to cultivated crops because of occasional flooding, wetness, and the dissected pattern of the landscape.

These soils are suited to use as rangeland, and they are used as rangeland. The potential plant community consists mainly of basin wildrye, tall sedges, western wheatgrass, Canby bluegrass, and plains cottonwood. Forbs and some woody plants are decreasers. Excessive grazing results in a decrease of desirable plants such as basin wildrye and tall sedges and an increase of western wheatgrass, sedges, and woody plants. Weedy plants likely to invade with continued grazing pressure are foxtail barley, quackgrass, and Baltic rush. The potential plant community produces 4,500 pounds of forage per acre in favorable years and 2,500 pounds per acre in unfavorable years.

These soils are poorly suited to windbreaks. The dissected landscape makes planting difficult. Flooding and the seasonal water table in some areas restrict the choice of trees and shrubs that can be grown. Suitable shrubs include common chokecherry, American plum, and silver buffaloberry. Suitable trees include Russian-olive and Siberian elm.

Occasional flooding seriously limits these soils for most urban uses.

Capability subclass Vlw, irrigated; Subirrigated range site, 15- to 19-inch precipitation zone.

131—Ustic Torrifluvents, wet. This map unit consists of nearly level to gently sloping loam and clay loam soils that formed in alluvium. The soils are on bottom lands and stream terraces in narrow valleys. The areas are

dissected by stream channels and drainageways; in some small areas there are multilevel terraces and short, steep slopes. The soils are mainly deep, moderately well drained or somewhat poorly drained, and moderately affected by salts. They are subject to flooding in periods of high seasonal runoff, and in the lower areas they have a high seasonal water table.

These soils are at an elevation of 2,300 to 3,800 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

These soils have moderate or high available water capacity. Runoff is slow or medium. Wind and water erosion are moderate hazards.

Included in mapping are small areas of well drained loam and clay loam soils and soils that are underlain by very gravelly material at a depth of 10 to 40 inches.

The soils in this unit are not suited to cultivated crops because of flooding, wetness, and the dissected pattern of the landscape.

These soils are suited to use as rangeland, and they are used as rangeland. The potential plant community consists mainly of basin wildrye, western wheatgrass, alkali cordgrass, alkali sacaton, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as basin wildrye, alkali cordgrass, and alkali sacaton and an increase of inland saltgrass, silver sage, needleandthread, fringed sagewort, foxtail barley, quackgrass, and broom snakeweed. Forage production is 4,500 pounds per acre in favorable years and 2,500 pounds per acre in unfavorable years.

These soils are poorly suited to windbreaks. The dissected pattern makes the planting of windbreaks difficult. These soils are moderately affected by salts, and only trees and shrubs that tolerate salts should be selected. Suitable shrubs include common chokecherry, American plum, and silver buffaloberry. Suitable trees include Russian-olive and Siberian elm.

Occasional flooding and wetness limit the use of these soils for most urban uses.

Capability subclass Vlw; Subirrigated range site, 10- to 14-inch precipitation zone.

132—Vanda clay, 0 to 2 percent slopes. This is a deep, well drained, nearly level soil that formed in clay alluvium on fans and terraces in valleys and on uplands. The elevation is 2,300 to 3,300 feet. Slopes are mainly medium in length. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown clay 6 inches thick; it has a thin light brownish gray vesicular crust 1/4- to 1/2-inch thick. The substratum is olive gray clay to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow.

Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is strongly affected by sodium and is subject to surface crusting; consequently, seedling emergence is impeded and crop yields are reduced.

Small areas of Marvan and Nobe soils are included with this soil in mapping.

Because this soil is strongly affected by sodium, it is very poorly suited to cultivated crops.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needlegrass, and Nuttall saltbush and an increase of plants such as prairie junegrass, inland saltgrass, foxtail barley, curlycup gumweed, plains pricklypear, and broom snakeweed. Forage production is 800 pounds per acre in favorable years and 300 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil is not suited to windbreaks because it is strongly affected by sodium.

The very slow permeability and high shrink-swell potential limit this soil for most urban uses. Septic tank absorption fields require special design because of the very slow permeability. Foundations and basements for houses require special design because of the high shrink-swell potential.

Capability subclass VIs, dryland; Dense Clay range site, 10- to 14-inch precipitation zone.

133—Vanda-Nobe clays, 0 to 2 percent slopes. This complex consists of soils on fans and terraces in valleys and on uplands. The elevation is 2,300 to 3,300 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Vanda soil makes up about 55 percent of the map unit, and the Nobe soil makes up 25 percent. Included with these soils in mapping are small areas of Absher, Benz, and Marvan soils. These soils make up about 20 percent of the map unit.

The Vanda soil is deep and well drained. It formed in clayey alluvium in smooth areas. Typically, a thin, light brownish gray vesicular crust that is 1/4- to 1/2-inch thick is on the surface. Below that, the surface layer is grayish brown clay 6 inches thick. The substratum is olive gray clay to a depth of 60 inches.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard. This soil is strongly affected by sodium and is subject to crusting at the surface; consequently, seedling emergence is impeded and crop yields are reduced.

The Nobe soil is deep and well drained. It formed in alluvium in depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay. The substratum is grayish brown clay to a depth of 30 inches and, below that, olive silty clay to a depth of 60 inches.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 60 inches, but the subsoil, which is strongly affected by sodium, is very hard when dry; thus, root penetration is impeded. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Because these soils are strongly affected by sodium, they are very poorly suited to cultivated crops.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Vanda soil. The potential plant community on the Vanda soil consists mainly of green needlegrass, western wheatgrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. The potential plant community on the Nobe soil consists of western wheatgrass, green needlegrass, prairie junegrass, Sandberg bluegrass, inland saltgrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needleandthread, prairie junegrass, Sandberg bluegrass, and inland saltgrass. Foxtail barley, curlycup gumweed, plains pricklypear, and broom snakeweed are likely to invade.

On the Vanda soil, the potential plant community produces 800 pounds of forage per acre in favorable years and 300 pounds per acre in unfavorable years. On the Nobe soil, forage production is 200 pounds per acre in favorable years and 75 pounds per acre in unfavorable years.

The soils in this complex are not suited to windbreaks because they are strongly affected by sodium.

The high shrink-swell potential and very slow permeability of these soils and the low strength of the Nobe soil are limitations for most urban uses. Septic tank absorption fields require special design because of the very slow permeability. Foundations and basements for houses require special design because of the low strength and high shrink-swell potential.

Capability subclass VIIs, dryland. Vanda soil is in Dense Clay range site, 10- to 14-inch precipitation zone; Nobe soil is in Saline Upland range site, 10- to 14-inch precipitation zone.

134—Vanda-Nobe clays, 2 to 8 percent slopes. This complex consists of soils on fans and terraces in valleys and on uplands. The elevation is 2,300 to 3,300 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Vanda soil makes up about 60 percent of the map unit, and the Nobe soil makes up 25 percent. Included

with these soils in mapping are small areas of Bascovy, Dilts, Lisam, and Marvan soils. These soils make up about 15 percent of the map unit.

The Vanda soil is deep and well drained. It formed in clayey alluvium in smooth areas. Typically, a thin light brownish gray vesicular crust that is 1/4- to 1/2-inch thick is on the surface. Below that, the surface layer is dark grayish brown clay 6 inches thick. The substratum is olive gray clay to a depth of 60 inches.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion are moderate hazards. This soil is strongly affected by sodium and is subject to crusting at the surface; consequently, seedling emergence is impeded and crop yields are reduced.

The Nobe soil is deep and well drained. It formed in alluvium in depressions. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay. The upper part of the substratum is grayish brown clay 23 inches thick, and the lower part is olive silty clay to a depth of 60 inches or more.

Permeability is very slow, and the available water capacity is low. The effective rooting depth is about 60 inches, but the subsoil, which is strongly affected by sodium, is very hard when dry; thus, root penetration is impeded. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is medium or rapid. Wind and water erosion are moderate hazards.

Because these soils are strongly affected by sodium, they are very poorly suited to cultivated crops.

These soils are suited to use as rangeland, and they are used as rangeland. Most of the forage is produced on the Vanda soil. The potential plant community on the Vanda soil consists mainly of green needlegrass, western wheatgrass, Nuttall alkaligrass, Nuttall saltbush, greasewood, and forbs. The potential plant community on the Nobe soil consists of western wheatgrass, green needlegrass, prairie junegrass, Sandberg bluegrass, inland saltgrass, Nuttall saltbush, greasewood, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, green needlegrass, Nuttall saltbush, and greasewood and an increase of needleandthread, prairie junegrass, Sandberg bluegrass, and inland saltgrass. Foxtail barley, curlycup gumweed, plains pricklypear, and broom snakeweed are likely to invade.

On the Vanda soil, the potential plant community produces 800 pounds of forage per acre in favorable years and 300 pounds per acre in unfavorable years. On the Nobe soil, forage production is 200 pounds per acre in favorable years and 75 pounds per acre in unfavorable years.

The soils in this complex are not suited to windbreaks because they are strongly affected by sodium.

The high shrink-swell potential and very slow permeability of these soils and the low strength of the

Nobe soil are limitations for most urban uses. Septic tank absorption fields require special design because of very slow permeability. Foundations and basements for houses require special design because of the low strength and high shrink-swell potential.

Capability subclass VIIs, dryland. Vanda soil is in Dense Clay range site, 10- to 14-inch precipitation zone; Nobe soil is in Saline Upland range site, 10- to 14-inch precipitation zone.

135—Vida clay loam, 4 to 8 percent slopes. This is a deep, well drained, gently rolling soil that formed in glacial till on glaciated uplands. The soil is at an elevation of 2,400 to 3,800 feet. Slopes are mainly short. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer, where it is mixed to a depth of about 7 inches, is dark grayish brown clay loam. The subsoil is mostly brown clay loam 7 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

Small areas of Dimmick, Nishon, Zahill, and Bearpaw soils are included with this soil in mapping. The nearly level Dimmick and Nishon soils are in depressions and are subject to ponding. The strongly sloping Zahill soil is on ridges.

The Vida soil is used for dryland crops and as rangeland. Dryland crops are mainly wheat, barley, and oats. Wind and water erosion are the main limitations to use of this soil for cultivated crops. Stripcropping, field windbreaks, tall wheatgrass barriers, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion. Water erosion damage is reduced by establishing grassed waterways, by maintaining crop residue, or by stripcropping on the contour.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. Excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of blue grama, prairie junegrass, needleandthread, western wheatgrass, fringed sagewort, common snowberry, shrubby cinquefoil, Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss.

Forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation

before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, allows desirable native plants to become reestablished, and thus increases forage production.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

136—Vida-Zahill clay loams, 8 to 15 percent slopes. This complex consists of strongly rolling soils on glaciated uplands. The elevation is 2,400 to 3,800 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Vida soil makes up about 45 percent of this map unit, and the Zahill soil makes up 45 percent. Included in mapping are small areas of Bearpaw and Williams soils. These soils make up about 10 percent of the map unit.

The Vida soil is deep and well drained. It formed in glacial till on the lower part of slopes. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is dark grayish brown clay loam. The subsoil is mostly brown clay loam 7 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Zahill soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium or rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The soil is calcareous throughout.

In some areas these soils are used for dryland crops, mainly wheat and barley. Wind and water erosion are the main limitations to use of these soils for cultivated crops. Effective in controlling wind and water erosion are strip cropping, tall-grass barriers, field windbreaks,

minimum tillage, tillage that utilizes crop residue, contour strip cropping, and grassed waterways. A permanent and adequately maintained cover of planted grasses or of natural vegetation helps to control wind and water erosion. Crop yields can be increased on the calcareous Zahill soil by additions of phosphate fertilizers.

These soils are suited to use as rangeland and are used mainly as rangeland. The potential plant community on the Vida soil consists of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs and some woody plants are decreasers. The potential plant community on the Zahill soil consists of bluebunch wheatgrass and little bluestem. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of plants such as Idaho fescue, needleandthread, prairie junegrass, western wheatgrass, fringed sagewort, blue grama, common snowberry, threadleaf sedge, shrubby cinquefoil, Kentucky bluegrass, annual grasses, Hood phlox, pussytoes, and clubmoss.

On the Vida soil, forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years. On the Zahill soil, forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a very serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

The soils in this complex are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slope and slow permeability limit these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IVe, dryland. Vida soil is in Silty range site, 15- to 19-inch precipitation zone; Zahill soil is in Thin Hilly range site, 15- to 19-inch precipitation zone.

137—Wabek gravelly loam, 8 to 35 percent slopes. This is a deep, well drained, strongly sloping to steep soil that formed in alluvium on terraces and on uplands. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is dark grayish brown and dark brown gravelly loam 8 inches thick. The

upper part of the substratum is light brownish gray very gravelly loamy coarse sand 7 inches thick. The lower part, to a depth of 60 inches, is grayish brown very gravelly coarse sand.

Permeability is very rapid, and the available water capacity is very low. The effective rooting depth is about 20 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is medium. Wind erosion is a moderate hazard, and water erosion is a severe hazard. The depth to very gravelly coarse sand is 7 to 20 inches. This soil is very droughty.

Small areas of Beaverell, Beaverton, and Shawmut soils are included with this soil in mapping.

The Wabek soil is not suited to cultivated crops because of droughtiness, steep slopes, and a severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of bluebunch wheatgrass, green needlegrass, needleandthread, and western wheatgrass. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass and green needlegrass and an increase of needleandthread, threadleaf sedge, prairie junegrass, Idaho fescue, blue grama, fringed sagewort, annual grasses, red threeawn, broom snakeweed, Hood phlox, and clubmoss.

Forage production is 900 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a very serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is not suited to windbreaks because it is very droughty.

In areas where slopes are less than 15 percent, this soil is suited to most urban uses. Underground water supplies can be polluted by liquid and solid waste disposal systems because of the very rapid permeability of the substratum. In areas where slopes are more than 15 percent, this soil is seriously limited for most urban uses.

Capability subclass VIs, dryland; Shallow to Gravel range site, 10- to 14-inch precipitation zone.

138—Warneke-Whitecow-Rock outcrop complex, 35 to 70 percent slopes. This complex consists of steep to very steep Warneke soil, steep to very steep Whitecow soil on south-facing slopes, and Rock outcrop. The elevation is 4,000 to 6,000 feet. The average annual precipitation is 19 inches, and the average annual temperature is 40 degrees F. The average growing season is 90 days.

The Warneke soil makes up about 40 percent of the map unit; the Whitecow soil makes up about 25 percent; and Rock outcrop makes up 20 percent. Included in mapping, and making up about 15 percent of the map unit, are small areas of Whitecow soil on north-facing slopes and Windham soil.

The Warneke soil is shallow and well drained. It formed on mountainsides in material that weathered from hard limestone. Typically, the surface layer is brown gravelly loam 4 inches thick. The subsoil is very pale brown, very channery loam 11 inches thick. Below that, there is limestone bedrock to a depth of 60 inches.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 15 inches. The average annual wetting depth of the soil under native vegetation is 15 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Hard bedrock is at a depth of 10 to 20 inches.

The Whitecow soil is deep and well drained. It formed on mountainsides in colluvium or alluvium derived from limestone. Typically, the surface layer is covered by an organic mat that is 1 inch thick. The upper part of the surface layer is dark grayish brown gravelly loam 3 inches thick. The lower part is grayish brown very gravelly loam 7 inches thick. The subsoil is light brownish gray very gravelly loam 10 inches thick. The substratum is light brownish gray extremely gravelly loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

Rock outcrop is on the crests and tops of mountains. It reduces productivity if the soils in this complex are used as woodland or rangeland.

These soils are suited mainly to use as woodland. A forest fire in 1936 burned most of the trees in the Little Rocky Mountains. A few scattered stands of ponderosa pine and lodgepole pine survived and have provided a seed source for the regeneration of trees. Grasses and shrubs cover most of the area and protect the soils from erosion. They are strong competitors for moisture and nutrients, however, and have delayed the reestablishment of trees in most parts of the Little Rocky Mountains.

The severe hazard of water erosion can be diminished by maintaining a permanent cover of natural vegetation.

These soils are used as rangeland and woodland. The potential forest understory plant community on the Warneke soil and on the Whitecow soil consists mainly of little bluestem, Richardson needlegrass, bluebunch wheatgrass, western wheatgrass, common snowberry, Idaho fescue, common chokecherry, and arrowleaf balsamroot. Continued excessive grazing results in a decrease of desirable plants such as little bluestem,

Richardson needlegrass, and bluebunch wheatgrass and an increase of lupine, arrowleaf balsamroot, Sandberg bluegrass, and Idaho fescue. Weedy plants likely to invade with continued grazing pressure are curlycup gumweed, rubber rabbitbrush, cheatgrass, and annual forbs.

The Warneke soil is capable of producing about 2,300 cubic feet, or 300 board feet (Scribner rule), per acre of ponderosa pine. The Whitecow soil is capable of producing about 3,900 cubic feet, or 7,800 board feet (Scribner rule), per acre of ponderosa pine. These production levels are from fully stocked, even-aged, unmanaged stands of 100-year-old trees.

The steep to very steep slopes and the low and very low available water capacity are limitations to the use of these soils for timber production. The slopes and the outcrops of rock limit the use of equipment and the kind of equipment that can be used in forest management.

Site scarification during harvest and regeneration operations are necessary to reduce plant competition and seedling mortality. To prevent excessive soil erosion, logs should not be skidded in drainageways, and to prevent deeply rutted skid trails from forming, numerous trails should be used in skidding logs.

The warm dry surface layer and the very low and low available water capacity severely reduce seedling survival. The Warneke soil is not suitable for commercial timber production because of low productivity, but timber should be maintained for watershed protection.

These soils are easily eroded if they are disturbed. Erosion control should be considered in choosing equipment and methods of forest management.

The soils in this complex are not suited to windbreaks because the slopes are more than 15 percent.

The steep to very steep slopes limit these soils for most urban uses.

Capability subclass VIIe, dryland.

139—Whitecow-Warneke gravelly loams, 25 to 60 percent slopes. This complex consists of steep to very steep Whitecow soil on south-facing slopes and Warneke soil. The elevation is 4,000 to 6,000 feet. The average annual precipitation is 19 inches, and the average annual temperature is 40 degrees F. The average growing season is 90 days.

The Whitecow soil makes up about 45 percent of this map unit, and the Warneke soil makes up 35 percent. Included with these soils in mapping, and making up about 20 percent of the map unit, are small areas of Whitecow soil on north-facing slopes, Windham soil, and Rock outcrop. Rock outcrop limits the use of equipment.

The Whitecow soil is deep and well drained. It formed in colluvium or alluvium on the lower part of mountainsides; it is on south- and west-facing slopes. Typically, the surface layer is covered by a layer of forest litter and humus that is 1 inch thick. The upper part of the surface layer is grayish brown gravelly loam 3 inches thick. The lower part is grayish brown very gravelly loam

7 inches thick. The subsoil is light brownish gray very gravelly loam 10 inches thick. The substratum is light brownish gray extremely gravelly loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Warneke soil is shallow and well drained. It formed on the upper part of mountain slopes in material that weathered from limestone. Typically, the surface layer is brown gravelly loam 4 inches thick. The subsoil is very pale brown, very channery loam 11 inches thick. Below that, there is limestone bedrock to a depth of 60 inches.

Permeability is moderate, and the available water capacity is very low. The effective rooting depth is about 15 inches. The average annual wetting depth of the soil under native vegetation is 15 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

These soils are used mainly as woodland. A forest fire in 1936 burned most of the trees in the Little Rocky Mountains. A few scattered stands of ponderosa pine and lodgepole pine survived and have provided a source of seed for the regeneration of trees. Grasses and shrubs cover most of the area and protect the soils from erosion. They are strong competitors for moisture and nutrients, however, and have delayed the reestablishment of trees in most parts of the Little Rocky Mountains.

The severe hazard of water erosion can be diminished by adequately maintaining a permanent cover of natural vegetation.

These soils are used as rangeland and woodland. Most of the grazable forage is produced on the Whitecow soil. The potential forest understory plant community on the Whitecow soil and on the Warneke soil consists mainly of bluebunch wheatgrass, common snowberry, common chokecherry, Saskatoon serviceberry, little bluestem, Idaho fescue, arrowleaf balsamroot, Oregon-grape, kinnikinnick, and common juniper. If the density of the overstory canopy is reduced, the amount of forage produced in the understory increases and the composition of the understory changes. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass, little bluestem, and Saskatoon serviceberry and an increase of Idaho fescue, lupine, arrowleaf balsamroot, prairie junegrass, common snowberry, cheatgrass, and weedy forbs.

These soils are suited to the production of ponderosa pine. The Whitecow soil is capable of producing about 3,900 cubic feet, or 7,800 board feet (Scribner rule), per acre of ponderosa pine. The Warneke soil is capable of producing about 2,300 cubic feet, or 300 board feet

(Scribner rule), per acre of noncommercial trees. These production levels are from fully stocked, even-aged, unmanaged stands of 100-year-old trees.

The steep to very steep slope and the low and very low available water capacity are limitations to the use of these soils for timber production. The slopes limit the use of equipment and the kind of equipment that can be used in forest management.

Site scarification during harvest and regeneration operations are necessary to reduce plant competition and seedling mortality. To prevent excessive soil erosion, logs should not be skidded in drainageways, and to prevent deeply rutted skid trails from forming, numerous trails should be used in skidding logs.

The low and very low available water capacity severely reduce seedling survival. The Warneke soil is not suitable for commercial timber production because of low productivity, but timber should be maintained for watershed protection. The Warneke soil is very easily eroded if it is disturbed. Erosion control should be considered in choosing equipment and methods of forest management.

The soils in this complex are not suited to windbreaks because slopes are more than 15 percent.

The steep to very steep slope limits these soils for most urban uses.

Capability subclass VIIe, dryland.

140—Whitecow association, steep. This association consists of Whitecow soils at an elevation of 4,000 to 6,000 feet. The average annual precipitation is 19 inches, and the average annual temperature is 40 degrees F. The average growing season is 90 days.

The Whitecow soil that is mainly on south-facing slopes makes up about 55 percent of this association, and the Whitecow soil that is mainly on north-facing slopes makes up 35 percent. Included in mapping, and making up about 10 percent of the association, are small areas of Warneke soil and small areas of Rock outcrop. The steep to very steep, shallow Warneke soil is on ridges and hills. Rock outcrop is on the crests of ridges and hills.

Whitecow soils are deep and well drained. They formed on mountainsides in colluvium or alluvium derived from limestone. The Whitecow soil on north- and east-facing slopes has a more effective moisture regime than the Whitecow soil on south- and west-facing slopes.

Typically, the Whitecow soil on north-facing slopes has a surface layer that is covered by an organic mat 1 inch thick. The upper part of the surface layer is grayish brown gravelly loam 3 inches thick, and the lower part is grayish brown, very gravelly loam 7 inches thick. The subsoil is light brownish gray, very gravelly loam 10 inches thick. The substratum is light brownish gray, extremely gravelly loam to a depth of 60 inches or more.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil

under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The soil is suited mainly to woodland use. A forest fire in 1936 burned most of the trees in the Little Rocky Mountains. A few scattered stands of ponderosa pine, lodgepole pine, and Douglas-fir survived and have provided a source of seed for the regeneration of trees. Grasses and shrubs cover most of the area and protect the soil from erosion. They are strong competitors for moisture and nutrients, however, and have delayed the reestablishment of trees in most parts of the Little Rocky Mountains.

The severe hazard of water erosion can be diminished by maintaining a permanent cover of natural vegetation.

Typically, the Whitecow soil on south-facing slopes has a surface layer that is covered by an organic mat 1 inch thick. The upper part of the surface layer is dark grayish brown gravelly loam 3 inches thick. The lower part is grayish brown, very gravelly loam 7 inches thick. The subsoil is light brownish gray, very gravelly loam 10 inches thick. The substratum is light brownish gray, extremely gravelly loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The soils in this association are used as rangeland and woodland. The potential forest understory plant community on the Whitecow soil on north- and east-facing slopes consists mainly of pinegrass, common snowberry, Oregon-grape, bearded wheatgrass, Columbia needlegrass, blue wildrye, common juniper, arrowleaf balsamroot, white spirea, common chokecherry, russet buffaloberry, twinflower, heartleaf arnica, kinnikinnick, and lupine. The potential forest understory plant community on the Whitecow soil on south- and west-facing slopes consists of bluebunch wheatgrass, Saskatoon serviceberry, little bluestem, skunkbush sumac, and common snowberry. If the density of the forest overstory canopy is reduced, the amount of forage produced in the understory increases and the composition of the understory changes. Continued excessive grazing results in a decrease of desirable plants such as Columbia needlegrass, bluebunch wheatgrass, and blue wildrye and an increase of plants such as common snowberry, arrowleaf balsamroot, lupine, Kentucky bluegrass, timothy, and cheatgrass.

The Whitecow soil on north-facing slopes is suited to the production of Douglas-fir and lodgepole pine. It is capable of producing about 4,665 cubic feet, or 12,570 board feet (Scribner rule), per acre of Douglas-fir and lodgepole pine. The Whitecow soil on south-facing slopes is suited to the production of ponderosa pine. It is capable of producing about 3,900 cubic feet, or 7,800

board feet (Scribner rule), per acre of ponderosa pine. These production levels are from fully stocked, even-aged, unmanaged stands of 100-year-old trees.

The steep slopes and low available water capacity limit these soils for timber production. The slopes limit the kind of equipment that can be used in forest management.

Site scarification during harvest and regeneration operations are necessary to reduce plant competition and seedling mortality. To prevent excessive soil erosion, logs should not be skidded in drainageways, and to prevent deeply rutted skid trails from forming, numerous trails should be used in skidding logs.

The soils are not suited to windbreaks because slopes are more than 15 percent.

The steep slopes limit these soils for most urban uses. Capability subclass VIIe, dryland.

141—Williams loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to undulating soil that formed in glacial till on glaciated uplands. The elevation is 2,400 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark grayish brown loam 6 inches thick. The subsoil is brown and grayish brown clay loam 14 inches thick. The substratum is mostly light brownish gray and grayish brown loam to a depth of 60 inches or more.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Elloam, Dimmick, Nishon, and Vida soils are included with this soil in mapping. The nearly level Elloam soil is in small depressions. It is moderately affected by sodium. The nearly level Dimmick and Nishon soils are in enclosed basins and are subject to ponding.

This Williams soil is used for dryland crops and as rangeland. The main dryland crops are wheat, barley, and oats.

Wind erosion is the main limitation to the use of this soil for cultivated crops. Effective in controlling wind erosion are stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of Idaho fescue, needleandthread, western wheatgrass, fringed sagewort,

common snowberry, shrubby cinquefoil, Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. Forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderately slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

142—Williams-Vida loams, 0 to 4 percent slopes. This complex consists of nearly level to undulating soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The average annual precipitation is 15 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Williams soil makes up about 55 percent of this map unit, and the Vida soil makes up 30 percent. Included with these soils in mapping are small areas of Bearpaw, Elloam, Nishon, and Dimmick soils. These soils make up about 15 percent of the map unit. The Elloam soil is moderately affected by sodium. It is in small depressions. The nearly level Nishon and Dimmick soils are in undrained basins.

The Williams soil is deep and well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown loam 6 inches thick. The subsoil is brown and grayish brown clay loam 14 inches thick. The substratum is mostly light brownish gray and grayish brown loam to a depth of 60 inches.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Vida soil is deep and well drained. It formed in glacial till. Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown and brown clay loam 10 inches thick. The

substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 40 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The soils in this complex are used for dryland crops and as rangeland. The main dryland crops are wheat and barley.

Wind erosion is the main limitation to the use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

The soils in this complex are suited to use as rangeland. The potential plant community on the Williams and Vida soils consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of plants such as Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, and shrubby cinquefoil. Weedy plants likely to invade with continued grazing pressure are Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss. The potential plant community produces 2,500 pounds of forage per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

These soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the slow permeability.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

143—Williams-Vida loams, 4 to 8 percent slopes.

This complex consists of gently rolling soils on glaciated uplands. The elevation is 2,400 to 3,600 feet. The

average annual precipitation is 15 inches, and the average annual temperature is 43 degrees F. The average growing season is 110 days.

The Williams soil makes up about 45 percent of this map unit, and the Vida soil makes up 40 percent. Included with these soils in mapping are small areas of Bearpaw, Nishon, Dimmick, and Zahill soils. These soils make up about 15 percent of this unit. The level to nearly level Dimmick and Nishon soils are in undrained basins. The Zahill soil is on ridges.

The Williams soil is deep and well drained. It formed in glacial till on the lower part of slopes and in areas between knolls and ridges. Typically, the surface layer is dark grayish brown loam 6 inches thick. The subsoil is brown and grayish brown clay loam 14 inches thick. The substratum is mostly light brownish gray and grayish brown loam to a depth of 60 inches.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The Vida soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsoil is dark grayish brown and brown clay loam 10 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is medium. Wind and water erosion are moderate hazards.

The soils in this complex are used for dryland crops and as rangeland. The main dryland crops are wheat and barley.

Wind and water erosion are the main limitations to the use of these soils for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

These soils are suited to use as rangeland. The potential plant community on the Williams and Vida soils consists mainly of rough fescue, bluebunch wheatgrass, and green needlegrass. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of plants such as Idaho fescue, needleandthread, prairie junegrass, western wheatgrass, fringed sagewort, blue grama, common snowberry, and big sagebrush. Weedy plants likely to invade with continued grazing pressure are Kentucky bluegrass, timothy, annual grasses, Hood phlox, pussytoes, and clubmoss.

Forage production is 2,500 pounds per acre in favorable years and 1,500 pounds per acre in unfavorable years.

The potential heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished, and thus forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The soils can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderately slow permeability limits these soils for most urban uses. Septic tank absorption fields require special design because of the limitations imposed by permeability.

Capability subclass IIIe, dryland; Silty range site, 15- to 19-inch precipitation zone.

144—Windham cobbly loam, 15 to 45 percent slopes. This is a deep, well drained, moderately steep to steep soil. It formed in alluvium on terraces and fans on uplands. The elevation is 3,200 to 4,500 feet. Slopes are mainly medium in length. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer is dark grayish brown cobbly loam 6 inches thick. The substratum is pale brown, very gravelly loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is low. The effective rooting depth is about 60 inches. The average wetting depth of the soil under native vegetation is 30 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. This soil has a large number of coarse fragments; consequently, it is droughty.

Small areas of Judith and Whitecow soils are included with this soil in mapping.

This soil is very poorly suited to cultivated crops because of steep slopes, droughtiness, and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue and bluebunch wheatgrass and an increase of plants such as western wheatgrass, fringed sagewort, needleandthread, blue grama, prairie junegrass, threadleaf sedge, clubmoss, annual grasses, Hood phlox, and pussytoes.

Forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

This soil is not suitable for windbreaks because the slopes are more than 15 percent.

The moderately steep to steep slopes limit this soil for most urban uses.

Capability subclass VIe, dryland; Thin Hilly range site, 15- to 19-inch precipitation zone.

145—Work clay loam, 0 to 4 percent slopes. This is a deep, well drained, nearly level to gently sloping soil that formed in alluvium on terraces and fans on uplands. The elevation is 2,800 to 4,000 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is grayish brown clay loam 6 inches thick. The subsoil is dark brown clay and grayish brown clay loam 13 inches thick. The upper part of the substratum is grayish brown clay loam 10 inches thick. The lower part, to a depth of 60 inches, is pale brown gravelly clay loam.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Water erosion is a slight hazard, and wind erosion is a moderate hazard.

Small areas of Gerdrum, Martinsdale, and Shaak soils are included with this soil in mapping. The Gerdrum soil is moderately affected by sodium. It is in small, sparsely vegetated depressions.

The Work soil is used for dryland and irrigated crops. It is also used as rangeland. The main dryland crops are wheat, oats, and barley. The main irrigated crops are wheat, barley, and alfalfa for hay.

Wind erosion is the main limitation to the use of this soil for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, shrubby cinquefoil, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes. Forage production is 2,000 pounds per acre in favorable years and 1,000 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue

spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderately slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability.

Capability subclass IIle, dryland, and IIle, irrigated; Silty range site, 15- to 19-inch precipitation zone.

146—Work clay loam, 4 to 8 percent slopes. This is a deep, well drained, moderately sloping soil that formed in alluvium on terraces and fans on uplands. The elevation is 2,800 to 4,000 feet. Slopes are mainly medium in length. The average annual precipitation is 14 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer of this soil is grayish brown clay loam 6 inches thick. The subsoil is dark brown clay and grayish brown clay loam 13 inches thick. The upper part of the substratum is grayish brown clay loam 10 inches thick. The lower part, to a depth of 60 inches, is pale brown gravelly clay loam.

Permeability is moderately slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 34 inches. Runoff is moderate. Wind and water erosion are moderate hazards.

Small areas of Gerdrum, Martinsdale, and Shaak soils are included with this soil in mapping. The Gerdrum soil is moderately affected by sodium. It is in small, sparsely vegetated depressions.

The Work soil is used mainly as rangeland. It is also used for dryland crops, mainly wheat, oats, and barley.

Wind and water erosion are the main limitations to the use of this soil for cultivated crops. Stripcropping, tall-grass barriers, field windbreaks, minimum tillage, tillage that utilizes crop residue, contour stripcropping, and grassed waterways can effectively control wind and water erosion.

This soil is suited to use as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, green needlegrass, and Idaho fescue. Sedges, forbs, and some woody plants are decreaseers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue, bluebunch wheatgrass, and green needlegrass and an increase of plants such as Idaho fescue, needleandthread, western wheatgrass, fringed sagewort, common snowberry, shrubby cinquefoil, Kentucky bluegrass, timothy, annual grasses, Hood phlox, and pussytoes.

Forage production is 2,000 pounds per acre in favorable years and 1,000 pounds per acre in unfavorable years.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, and Rocky Mountain juniper. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The moderately slow permeability limits this soil for most urban uses. Septic tank absorption fields require special design because of the moderately slow permeability.

Capability subclass IIle, dryland; Silty range site, 15- to 19-inch precipitation zone.

147—Yamac loam, 2 to 4 percent slopes. This is a deep, well drained, gently sloping soil on fans, foot slopes, and terraces on uplands. It formed in alluvium. The elevation is 2,300 to 3,600 feet. Slopes are mainly medium in length. The average annual precipitation is 13 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

Typically, the surface layer of this soil is grayish brown loam 4 inches thick. The substratum is light brownish gray loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

Small areas of Delpoint soil and Havre soil are included with this soil in mapping. The Delpoint soil is undulating and is moderately deep. It is on the upper part of slopes. The Havre soil is in narrow drainageways.

The Yamac soil is used for dryland crops and as rangeland. The main dryland crops are wheat, barley, and oats.

Wind erosion is the main limitation to use of this soil for cultivated crops, but stripcropping, tall-grass barriers, field windbreaks, minimum tillage, and tillage that utilizes crop residue can effectively control wind erosion.

This Yamac soil is suited to use as rangeland. The potential plant community consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass and green needlegrass and an increase of needleandthread, blue grama, and fringed sagewort. Annual grasses, broom snakeweed, and clubmoss are likely to invade. Forage production is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years.

Clubmoss is very competitive, and its potential heavy infestation is a serious problem. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

This soil is suited to the use of machinery in preparing a seedbed and in planting.

This soil can be used for windbreaks. Suitable trees include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

This soil is suited to most urban uses.

Capability subclass IIle, dryland; Silty range site, 10- to 14-inch precipitation zone.

148—Yamac-Benz loams, 0 to 4 percent slopes.

This complex consists of nearly level to gently sloping soils on fans and terraces in valleys and on uplands. The elevation is 2,300 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Yamac soil makes up about 50 percent of this map unit, and the Benz soil makes up 35 percent. Included with these soils in mapping are small areas of Cabbart, Delpoint, Havre, and Harlem soils. These soils make up about 15 percent of the map unit. The Cabbart soil is on knolls and ridges. Havre and Harlem soils are in narrow drainageways.

The Yamac soil is deep and well drained. It formed in alluvium on the upper part of slopes. Typically, the surface layer is grayish brown loam 4 inches thick. The subsoil is light olive brown loam 7 inches thick. The substratum is light brownish gray loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 36 inches. Runoff is slow. Wind erosion is a moderate hazard, and water erosion is a slight hazard.

The Benz soil is deep and well drained. It formed in alluvium in sparsely vegetated areas. Typically, the surface layer is dark grayish brown loam 3 inches thick. The substratum, to a depth of 13 inches, is grayish brown loam; below that, to a depth of 60 inches, it is mainly grayish brown loam and clay loam stratified with thin lenses of fine sandy loam.

Permeability is slow, and the available water capacity is moderate. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 25 inches. Runoff is medium. Wind and water erosion are moderate hazards. This soil is strongly affected by sodium and is subject to surface crusting; consequently, seedling emergence is impeded and crop yields are reduced.

In some small areas, the soils in this complex are used for dryland crops, mainly wheat and barley. The Benz soil is very poorly suited to cultivated crops.

The soils in this complex are suited to use as rangeland and are used mainly as rangeland. Most of

the forage is produced on the Yamac soil. The potential plant community on the Yamac soil consists mainly of western wheatgrass, green needlegrass, needleandthread, winterfat, silver sagebrush, and forbs. The potential plant community on the Benz soil consists of western wheatgrass, prairie junegrass, Sandberg bluegrass, inland saltgrass, Nuttall saltbush, greasewood, green needlegrass, and forbs. Continued excessive grazing results in a decrease of desirable plants such as western wheatgrass, Nuttall saltbush, and green needlegrass and an increase of needleandthread, blue grama, threadleaf sedge, fringed sagewort, forbs, annual grasses, clubmoss, broom snakeweed, and foxtail barley.

Forage production on the Yamac soil is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. Forage production on the Benz soil is 400 pounds per acre in favorable years and 200 pounds per acre in unfavorable years.

The possibility of heavy infestation by clubmoss is a serious problem. Clubmoss is very competitive. It forms a spongelike mat that absorbs much of the precipitation before it can enter the soil. Clubmoss can be effectively removed by mechanical means. Its removal increases water infiltration, reduces plant competition, and allows desirable native plants to become reestablished; thus, forage production increases.

These soils are suited to the use of machinery in preparing a seedbed and in planting.

The Yamac soil can be used for windbreaks. The Benz soil is not suitable for windbreaks because it is strongly affected by sodium. Suitable trees for the Yamac soil include Russian-olive, green ash, Siberian elm, white and golden willows, ponderosa pine, Scotch pine, blue spruce, Rocky Mountain juniper, and Douglas-fir. Suitable shrubs include Siberian peashrub, common chokecherry, American plum, silver buffaloberry, and lilac.

The slow permeability of the Benz soil limits these soils for most urban uses. Septic tank absorption fields on the Benz soil require special design because of the slow permeability.

Capability subclass IVe, dryland. Yamac soil is in Silty range site, 10- to 14-inch precipitation zone; Benz soil is in Saline Upland range site, 10- to 14-inch precipitation zone.

149—Yamac-Wabek association, moderately steep.

This association consists of deep, well drained soils on uplands. The elevation is 2,800 to 3,600 feet. The average annual precipitation is 12 inches, and the average annual temperature is 43 degrees F. The average growing season is 115 days.

The Yamac soil makes up about 60 percent of this association, and the Wabek soil makes up 25 percent. Included with these soils in mapping are small areas of Beaverell, Delpoint, and Lisam soils. These soils make up about 15 percent of the association.

The Yamac soil formed in alluvium on the lower part of slopes. Typically, the surface layer is grayish brown loam

4 inches thick. The subsoil is light olive brown loam 7 inches thick. The substratum is light brownish gray loam to a depth of 60 inches.

Permeability is moderate, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 30 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Wabek soil formed in alluvium in the higher lying areas on the edge of terraces and the top of ridges. Typically, the surface layer is dark grayish brown and dark brown gravelly loam 8 inches thick. The upper part of the substratum is light brownish gray, very gravelly loamy coarse sand 7 inches thick. The lower part is grayish brown very gravelly coarse sand to a depth of 60 inches or more.

Permeability is very rapid, and the available water capacity is very low. The effective rooting depth is about 20 inches. The average annual wetting depth of the soil under native vegetation is 20 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard. Depth to very gravelly coarse sand is 7 to 20 inches. This soil is very droughty.

The soils in this association are not suited to cultivated crops because of moderately steep slopes and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

These soils are suited to use as rangeland and are used as rangeland. Most of the forage is produced on the Yamac soil. The potential plant community on the Yamac soil consists mainly of western wheatgrass, bluebunch wheatgrass, needleandthread, green needlegrass, winterfat, prairie sandreed, and forbs. The potential plant community on the Wabek soil consists of needleandthread, western wheatgrass, and prairie sandreed. Forbs and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as bluebunch wheatgrass, prairie sandreed, and western wheatgrass and an increase of needleandthread, threadleaf sedge, blue grama, prairie junegrass, fringed sagewort, annual grasses, red threeawn, and broom snakeweed.

Forage production on the Yamac soil is 1,500 pounds per acre in favorable years and 800 pounds per acre in unfavorable years. Forage production on the Wabek soil is 900 pounds per acre in favorable years and 500 pounds per acre in unfavorable years.

The soils in this association are not suited to windbreaks because the slopes are more than 15 percent.

The moderately steep slopes limit these soils for most urban uses.

Capability subclass VIe, dryland. Yamac soil is in Silty range site, 10- to 14-inch precipitation zone; Wabek soil is in Shallow to Gravel range site, 10- to 14-inch precipitation zone.

150—Zahill clay loam, 25 to 45 percent slopes. This is a deep, well drained soil that formed in glacial till on glaciated uplands. The elevation is 2,400 to 4,000 feet. Slopes are mainly medium in length. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 32 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

Small areas of Cabba, Norbert, and Vida soils are included with this soil in mapping.

The Zahill soil is not suited to use as cropland because of steep slopes and the severe hazard of water erosion. A permanent and adequately maintained cover of natural vegetation helps to control water erosion.

This soil is suited to use as rangeland and is used as rangeland. The potential plant community consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue and bluebunch wheatgrass and an increase of plants such as Idaho fescue, western wheatgrass, needleandthread, blue grama, prairie junegrass, threadleaf sedge, annual grasses, Hood phlox, and pussytoes. Forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

This soil is not suitable for windbreaks because of slope.

Steep slopes limit these soils for most urban uses.

Capability subclass VIe, dryland; Thin Hilly range site, 15- to 19-inch precipitation zone.

151—Zahill-Vida clay loams, 15 to 35 percent slopes. This complex consists of hilly to steep Zahill soil and hilly Vida soil on glaciated uplands. The elevation is 2,400 to 3,800 feet. The average annual precipitation is 15 inches, and the average annual temperature is 42 degrees F. The average growing season is 110 days.

The Zahill soil makes up about 50 percent of this map unit, and the Vida soil makes up 40 percent. Included with these soils in mapping are small areas of Bearpaw, Cabbart, and Lisam soils. These soils make up about 10 percent of the map unit.

The Zahill soil is deep and well drained. It formed in glacial till on knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is grayish brown clay loam. The substratum is grayish brown clay loam to a depth of 60 inches.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches.

The average annual wetting depth of the soil under native vegetation is 32 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The Vida soil is deep and well drained. It formed in glacial till on slopes below knolls and ridges. Typically, the surface layer, where it is mixed to a depth of about 7 inches, is dark grayish brown clay loam. The subsoil is mostly brown clay loam 7 inches thick. The substratum is grayish brown clay loam to a depth of 60 inches or more.

Permeability is slow, and the available water capacity is high. The effective rooting depth is about 60 inches. The average annual wetting depth of the soil under native vegetation is 32 inches. Runoff is rapid. Wind erosion is a moderate hazard, and water erosion is a severe hazard.

The soils in this complex are not suited to cultivated crops because of the slope and the severe hazard of water erosion. A permanent and adequately maintained

cover of natural vegetation helps to control water erosion.

These soils are suited to use as rangeland and are used as rangeland. The potential plant community on these soils consists mainly of rough fescue, bluebunch wheatgrass, and little bluestem. Sedges, forbs, and some woody plants are decreasers. Continued excessive grazing results in a decrease of desirable plants such as rough fescue and bluebunch wheatgrass and an increase of Idaho fescue, needleandthread, blue grama, prairie junegrass, threadleaf sedge, annual grasses, Hood phlox, and pussytoes. Forage production is 1,500 pounds per acre in favorable years and 900 pounds per acre in unfavorable years.

The soils in this complex are not suited to windbreaks because of slope.

The steep slopes limit these soils for most urban uses. Capability subclass VIe, dryland; Thin Hilly range site, 15- to 19-inch precipitation zone.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops

E. Lee Jones, resource conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and of hay are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

There are about 550,000 acres of cropland in this survey area. The cropland includes about 470,000 acres of dryfarmed land and 80,000 acres of irrigated land. The acreage of the dryfarmed land has increased in recent years, particularly on the Fort Belknap Indian Reservation, because of the higher return per acre from cultivated crops than from range.

The main dryland crops are spring wheat, winter wheat, and barley. Oats and hay are also seeded. The main management needs on dryfarmed land are conserving moisture, controlling weeds, maintaining or improving fertility, controlling soil loss from wind and water erosion, and controlling or preventing saline seep.

Generally, dryfarming methods include alternating strips of crop and fallow for production of small grains. Leaving crop residue on the surface, leaving the surface cloddy or rough, establishing strips of proper width, using chemicals to control insects and weeds, using proper levels of fertilization, and timely use of tillage equipment generally can maintain or improve yields.

The main irrigated crops are alfalfa, mixed legume-grass hay, spring wheat, and barley. Corn for silage, oats, and sugar beets are also seeded. The main management needs on irrigated cropland are conserving irrigation water, improving drainage, controlling weeds, and preventing or reducing salinity and alkalinity. Nearly two-thirds of the irrigated land in the Milk River Valley has moderate or high levels of salinity or alkalinity. Overirrigation, lack of adequate drainage, and slowly permeable soils have been the major causes of the salinity problem.

Some dryfarmed land is used for crested wheatgrass for early spring grazing. Some of the crested wheatgrass was seeded in the late 1930's on abandoned cropland, but, more recently, fields are being established as part of a planned ranch operation.

The potential of the soils in the survey area for increased production of food is good. More than 150,000 acres of potentially good dry cropland is now used as range. An additional 20,000 acres of cropland could be irrigated under existing irrigation systems if an adequate water supply were available. In addition to the reserve

production capacity of the rangeland, food production can be increased on the cultivated land if the latest crop production technology is applied.

soil erosion

Soil erosion is a major problem on most of the cultivated land and on some of the rangeland in the survey area. Loss of the surface layer through erosion affects soil productivity, soil tilth, available water capacity, rooting depth, and the sediment load in streams. Some cultivated soils, such as the Thoeny and Shaak soils, have a loam surface layer and a dense clayey subsoil. Loss of the surface layer through erosion exposes the clayey subsoil and makes the preparation of a good seedbed and tillage difficult. Loss of the surface layer through erosion on soils underlain by bedrock or gravel and sand, such as the Belain and Attewan soils, reduces the rooting depth and the available water capacity.

Generally, wind erosion is a hazard on all cultivated soils. Sandy soils, such as Chinook and Lihen soils, are highly susceptible to soil loss by wind. These sandy soils require narrow field strips and, in some places, a permanent cover to protect them from wind erosion. A loamy or clayey surface layer in areas that are block-farmed or where wide strips are used is very susceptible to wind erosion. Overgrazed rangeland is also susceptible to wind erosion.

Runoff causes erosion on most of the cropland and on some of the rangeland, particularly on steep slopes, long slopes, and lower lying areas below steeper slopes. Sediment from water erosion pollutes streams and rivers and lowers the quality of water for municipal uses, recreation, and fish and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. Because eroded soils are less productive, a cropping system that keeps vegetative cover on the soil for an extended period reduces soil erosion and maintains the productive capacity of the soil. On livestock farms, good forage and grass cover on sloping land reduces soil loss to an acceptable level.

Leaving crop residue on the surface helps to reduce erosion and to increase water infiltration. Also helpful are leaving the surface rough, establishing wind strips of proper width, establishing grassed waterways, farming on the contour, contour tillage or contour stripcropping, and planting field windbreaks or grass wind barriers. Contour tillage and contour stripcropping are not practical on undulating or rolling glacial soils, such as Kevin and Vida soils, because the slopes are short and irregular.

Information about erosion control practices for each kind of soil is available in local offices of the Soil Conservation Service.

saline seep

Saline seep is a serious potential hazard in the survey area. The soils on about 500 to 600 acres are too wet

and saline to farm. These areas prevent or hinder farming on several thousand acres of surrounding cropland (3). The saline seeps are increasing in size at a rate of about 10 percent per year. The size of the areas ranges from less than one-tenth acre to more than 40 acres.

The saline seep occurs mostly on cultivated soils on uplands where sedimentary beds underlie the surface at a relatively shallow depth. The alternate crop-fallow farming system, which is commonly used, allows precipitation not used by plants to pass through the soil in the recharge area. This water dissolves salts, becomes salty, and collects on an impermeable underlying layer of shale or rock. The salty water then flows laterally along the beds. It surfaces as a low-volume saline spring or saline seep.

Saline seep can be controlled by reseeding the contributing or recharge area to permanent vegetation. A deep-rooted crop such as alfalfa will effectively reduce the water table. A continuous cropping system or a 2-year crop, 1-year fallow cropping system prevents or controls saline seep and also increases overall crop production.

soil drainage

Soil drainage is good in the survey area except for part of the Milk River Valley, small areas along some streams and drainageways, and "potholes" on the glaciated uplands.

About one-half of the irrigated land in the Milk River Valley needs improved drainage. Lack of adequate slope and drainage outlets, slowly permeable soils, and excess use of water for irrigation have caused the water table and soil salinity to build up.

There are about 12,000 acres of somewhat poorly drained soils and poorly drained soils in the "potholes" on the glaciated plains. These are the Dimmick and Nishon soils; they receive surface water from surrounding areas. Drainage of these soils generally is not practical because of the terrain and the lack of natural drainageways. In cultivated areas the somewhat poorly drained soils can be planted to grain crops in most years; on the poorly drained soils, however, seeding of crops is prevented or delayed more than half the time. These soils are very productive of forage, and the wetter areas are useful as habitat for wildlife.

Soils in more than 15,000 acres along small streams and drainageways are subject to wetness to some degree. The drainage is a problem mainly in cultivated areas. These areas are more productive of forage than the adjacent rangeland.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The capability classification of each map unit is given in the section "Detailed soil map units."

The soils in this survey area have been grouped into capability subclasses but have not been grouped into capability units.

rangeland

Joseph A. Wirak, range conservationist, Soil Conservation Service, prepared this section.

About 79 percent of the land in the survey area is rangeland or grazable woodland. Livestock consists mostly of cattle, but in the 1920's, 1930's, and early 1940's there were large numbers of sheep and horses.

Cow-calf is the major livestock type of operation. The average size of ranches in the survey area, excluding the Fort Belknap Indian Reservation, is 5,500 acres.

On some ranches only enough land is cultivated to produce hay for the unit. On other ranches, grain production is combined with raising livestock. Only a few ranches have commercial feedlots. Most livestock grazing is on native rangeland, but some ranchers use fields of crested wheatgrass as early spring pasture. In the Milk River valley and along the many creeks and streams in the area, irrigated hay and cropland are common.

The native vegetation in many parts of the survey area has been changed by prolonged heavy grazing. Desirable grasses and forbs, such as bluebunch wheatgrass, rough fescue, green needlegrass, winterfat, and western wheatgrass, have been replaced by needleandthread, blue grama, shrubby cinquefoil, fringed sagewort, cactus, and clubmoss. Forage production, consequently, has been reduced.

Complete seedbed preparation and seeding the desirable adapted introduced species or the native grasses and legumes can increase forage production. Plantings of introduced species should be fenced separately from native range and managed as a separate unit. If a grazing system or management plan is applied following renovation or seeding, the rangeland will maintain production near its potential.

In the Bearpaw Mountains and Little Rocky Mountains where slopes generally are too steep to permit reseeding or renovation, the range condition can be improved with rest or a deferred-rotation grazing system and proper stocking. Cross-fencing and stockwater developments can help distribute livestock to relieve pressure in overgrazed areas and to make use of undergrazed areas.

Livestock do not fully utilize forage on much of the sandstone and shale uplands in the southern part of the survey area. Good watering areas for livestock are difficult to develop. Springs, suitable dam sites, or water-bearing aquifers for wells are scarce. Proper placement of rain traps or catchment basins and of salt improves livestock distribution and forage utilization.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management

generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of water erosion and soil blowing. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

woodland management and productivity

Harold E. Hunter, woodland conservationist, Soil Conservation Service, prepared this section.

There are about 80,000 acres of forest land in the survey area, but only about 18,000 acres are presently considered potential commercial woodland. The largest areas of forest land are on the shale and sandstone uplands and on the Little Rocky Mountains and Bearpaw Mountains. Most forests have a wide range in stand density.

The main types of forest cover generally correspond to geographical areas. The principal trees in the Bearpaw Mountains are ponderosa pine; there are smaller numbers of Rocky Mountain juniper, quaking aspen, and Douglas-fir. The principal trees on the shale and sandstone uplands in the southern half of the survey area are ponderosa pine; there are smaller numbers of Rocky Mountain juniper, limber pine, and Douglas-fir. The principal trees on the stream or river bottoms are plains cottonwood. The variety of trees is wider in the Little Rocky Mountains. There is mostly ponderosa pine on the south- and west-facing slopes and quaking aspen, paper birch, lodgepole pine, and Douglas-fir on the north- and east-facing slopes.

The ponderosa pine in the southeastern two-thirds of the Bearpaw Mountains presently has low commercial value, except for posts and poles, because of the slow rate of growth and the poor quality of the wood. There is, however, an area at the headwaters of Clear and People Creeks that has some stands of Douglas-fir, lodgepole pine, and ponderosa pine that are of commercial quality.

The ponderosa pine on the shale and sandstone uplands generally is not considered to be of commercial value because of the slow rate of growth and the poor quality of the wood. It has value for posts and poles, and some individual trees are suitable for saw logs.

The cottonwood trees along the stream or river bottoms have little value as woodland. The stands, of mixed age and size, are in strips along the channels. These trees are highly suitable for wildlife habitat and for streambank protection.

The Little Rocky Mountains have mixed stands of forest cover because of changes in climate and the different aspects and because the area was burned over in 1936. On the north- and east-facing slopes, the moisture and temperature regimes are favorable for Douglas-fir and lodgepole pine, and on the warmer and

drier south- and west-facing slopes, the regimes are favorable for ponderosa pine. The mature trees that were not burned have good timber value; however, the quantity is limited. The trees reestablished since 1936 generally are too small for saw logs, but stands of lodgepole pine have commercial value for poles and posts.

The greatest potential for woodland production is mainly in the Little Rocky Mountains and part of the Bearpaw Mountains. Reestablishment of ponderosa pine on the south-facing slopes and Douglas-fir on the north-facing slopes in the Little Rocky Mountains has been slow. Management practices such as reseedling of adapted tree species in open areas or in thin forest stands and thinning of trees in dense stands could increase timber production.

All forest areas, regardless of timber production, are valued for other purposes such as watershed protection, livestock grazing, and wildlife habitat. Forests presently considered noncommercial, such as the areas of ponderosa pine on the shale and sandstone uplands, will probably have enough value to be harvested for pulp and chips in the future.

The estimates given in the map unit descriptions for board feet and cubic feet of production are based on the following utilization standards.

The board feet of production for Douglas-fir and ponderosa pine is based on the Scribner rule of trees 11.6 inches or more in diameter at breast height. The board feet of production for lodgepole pine is based on the Scribner rule of trees 10.0 inches or more in diameter at breast height or higher to an 8-inch top.

The total cubic feet of production for Douglas-fir and ponderosa pine is based on all trees 0.6 inch in diameter including stump and tip but not bark. The total cubic feet of production for lodgepole pine is based on all trees larger than 4.5 feet tall from groundline to tip.

woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 6, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 8 and interpretations for dwellings without basements and for local roads and streets in table 7.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to

flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

wildlife

Ronald F. Batchelor, biologist, Soil Conservation Service, prepared this section.

Wildlife is a product of the land. The abundance of a species is directly related to the extent and diversity of its habitat. The relationship of wildlife to soils is better expressed as a soil-vegetation-wildlife relationship, inasmuch as species of wildlife are more readily associated with the plant communities that make up their habitat than with specific soils alone. Productive and well-managed soils generally support or have potential to support a vigorous wildlife population. Together, plants and animals make up natural communities that are governed by many environmental influences of which soil is but a part.

The quality and interspersion of habitat determine the wildlife population level. The suitability of a given habitat for a species of wildlife depends greatly on the nature of plant communities present, while the quantity, quality, and distribution of a habitat is determined by prevailing land use practices and management. These factors are governed to some extent by the soils of the area.

Rangeland, coniferous forests, dry and irrigated farmland, riparian woodland, streams and rivers, and ponds and reservoirs provide a variety of wildlife habitat in the survey area.

Irrigated and dryland farming made possible the successful introduction of the ring-necked pheasant, particularly in the bottom lands along the Milk River and

its tributaries. Such success was possible because varied patterns of land use that included small grains, irrigated cropland, and an abundance of annual weeds and perennial shrubs provided both food and cover. In recent years, more intensive "clean farming," the loss of brushy fence rows and densely vegetated ditchbanks, and fewer oddly shaped areas have reduced the available habitat and caused a decline in the number of pheasants.

Land management practices that are beneficial to pheasants include proper grazing, protection of woody cover from burning or eradication, and the retention of stubble and waste grain in winter through the elimination of fall tillage. Woody plantings in the form of shelterbelts or windbreaks are beneficial to pheasants and other game and nongame animals.

The Harlem-Havre-Lardell map unit includes the major part of the Milk River Valley, and it provides habitat for ring-necked pheasant in the form of irrigated and dry cropland, brushy ditchbanks, and fence rows. The Vida-Bearpaw-Zahill and Kevin-Scobey-Hillon map units provide good pheasant habitat in the form of grainfields, shelterbelts, and brushy drainageways.

Sharp-tailed grouse inhabit much of the uplands where grainfields and brushy thickets of fruit-bearing shrubs, including chokecherry, Woods rose, common snowberry, skunkbush sumac, and silver buffaloberry provide excellent habitat. When grouse populations are high, the grouse extend their range into drainageways surrounded by small grain crops. When populations are low, they inhabit mostly drainageways where stands of trees and shrubs are interspersed with grassland.

The gray, or Hungarian, partridge is also associated with cropland-grassland areas. Like that of sharp-tailed grouse, the gray partridge population fluctuates, building to a high followed by a decline. Such population fluctuations result from changes in available habitat, weather variations, and possibly disease.

Land management practices beneficial to sharp-tailed grouse and gray partridge include proper grazing use of rangelands to insure that sufficient plant residue is retained as cover for nesting, roosting, and brood rearing; the protection of brushy draws and fence rows; and the establishment of shelterbelts.

The Kevin-Scobey-Hillon, Telstad-Joplin, Vida-Bearpaw-Zahill, Hillon-Lisam-Cabbart, and Hedoes-Belain-Castner map units support plant communities with good potential for sharp-tailed grouse and gray partridge. Within these units, grainfields, shelterbelts and windbreaks, brushy drainageways, and a mixed plant community of trees, shrubs, and grasslands provide suitable habitat for these prairie species.

Sage grouse inhabit sagebrush-covered rangelands throughout the area. Optimum sage grouse habitat is characterized by communities of big sagebrush and silver sagebrush with a variety of forbs and grasses and the environmental factors associated with such plant communities.

The Bearpaw-Vida-Elloam, Lisam-Dilts-Bascovy, and Lisam-Dilts-Rock outcrop, shale, map units provide good habitat for sage grouse in the form of brushy drainageways and sagebrush-covered rangelands.

The blue grouse, a forest-dwelling species, is common throughout the coniferous woodlands of the survey area, especially in the Little Rocky Mountains and the Bearpaw Mountains. The habitat requirements of blue grouse vary with the seasons. They winter at high elevations, then early in spring they descend to semi-open woodland for breeding, nesting, and brood rearing.

Blue grouse are closely associated with the distribution patterns of true firs and Douglas-fir in Montana. The extent and quality of their habitat are largely determined by forest management practices, grazing, and fire. The brushy thickets, stream bottoms, mixed forests, and grazable woodlands of the Hedoes-Belain-Castner and Whitecow-Macmeal-Warneke map units provide suitable habitat for blue grouse populations within the survey area.

Merriam's turkeys have been introduced in the southern part of the Little Rocky Mountains. Suitable habitat is generally restricted to open forests of ponderosa pine in rugged terrain. Turkeys are more numerous in forests that have a vegetative cover of ponderosa pine with grasses, deciduous trees, and shrubs in scattered small openings and in drainageways throughout the forest. The Whitecow-Macmeal-Warneke map unit provides most of the suitable habitat for Merriam's turkey within the survey area.

Pronghorn antelope inhabit the sagebrush-grassland ranges of the survey area. The potential for maintaining pronghorn herds is largely dependent on the proper management of rangelands. If ranges are overgrazed, competition for food between domestic livestock and pronghorns can be serious. There is little competition on well-managed range. Pronghorns utilize forbs and browse that cattle seldom eat unless forced to do so because of overgrazing.

The Kevin-Scobey-Hillon, Telstad-Joplin, Vida-Bearpaw-Zahill, Bearpaw-Vida-Elloam, Hillon-Lisam-Cabbart, Attewan-Wabek-Beaverell, Martinsdale-Shawmut-Turner, Shaak-Attewan-Work, Barkof-Cabba-Windham, Cabbart-Delpoint, and Lisam-Dilts-Bascovy map units provide most of the suitable habitat for pronghorn antelope.

White-tailed and mule deer are common throughout much of the survey area. White-tailed deer generally inhabit the lowlands and valleys of the Missouri and Milk Rivers, stream bottoms, and lower foothills adjacent to farmlands. Mule deer inhabit wooded areas, broken rangeland, the Missouri breaks, and brushy watercourses. The Harlem-Havre-Lardell, Hedoes-Belain-Castner, and Whitecow-Macmeal-Warneke map units provide suitable habitat for white-tailed deer.

The Kevin-Scobey-Hillon, Vida-Bearpaw-Zahill, Hillon-Lisam-Cabbart, and Hedoes-Belain-Castner map units provide habitat for mule deer.

A small population of Rocky Mountain elk inhabits the Missouri breaks in the southern part of the survey area. Habitat for these elk is generally confined to the rugged breaks and canyons. Elk prefer native bunchgrass ranges, but they are adaptable and can frequently be found in adjacent woodlands and canyons. The Hedoes-Belain-Castner and Whitecow-Macmeal-Warneke map units contain the main areas of suitable elk habitat within the survey area.

Many ponds and reservoirs throughout the survey area provide suitable habitat for waterfowl during spring and fall migrations as well as during the nesting seasons.

On the Vida-Bearpaw-Zahill and Kevin-Scobey-Hillon map units there are many potholes, reservoirs, and stockwater ponds that provide suitable habitat for ducks, geese, and a variety of shore and marsh birds.

Beaver, raccoon, and mink inhabit areas along the major rivers and streams. Cottontail rabbits, badger, ground squirrels, coyotes, jackrabbits, and other small mammals are common in most of the survey area.

Populations of game and nongame species can be increased through application of conservation practices that improve the habitat. These include the development of oddly or irregularly shaped areas in and adjacent to farmland, protection of these areas from fire or grazing, and establishment of woody vegetation to provide winter cover. Wildlife habitat can also be improved by proper grazing use, planned grazing systems, stripcropping, field windbreaks, and pond construction.

engineering

Wayne E. Otto, area engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of of specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were

not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 7 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves,

utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

sanitary facilities

Table 8 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 8 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be

expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 8 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of

landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 8 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 9 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor*. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil

layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. The ratings in table 9 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading

is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 10 gives information on the soil properties and site features that affect water management. It gives for each soil the restrictive features that affect pond reservoir areas; embankments, dikes, and levees; drainage; irrigation; terraces and diversions; and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area. A rating of *favorable* means that soil properties and site features are generally favorable and limitations are minor and easily overcome.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow.

Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a

cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

This publication does not contain engineering test data, but some tests were made by the State Highway Commission of Montana in cooperation with the Federal Highway Administration, Department of Transportation. Data from those tests were considered in estimating the engineering index properties in table 11.

engineering index properties

Table 11 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27

percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 12 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume

change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
- 4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

soil and water features

Table 13 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent

slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 13 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 13 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 13.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The kind of bedrock and its hardness as related to ease of excavation is also given. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing.

Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (5). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 14, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class,

mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (4). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (5). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Absher series

The Absher series consists of deep, moderately well drained soils that formed in alluvium. These soils are on fans and terraces on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 15 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 100 to 125 days.

Typical pedon of Absher clay loam, in native grass, 1,700 feet east and 400 feet north of the SW corner of sec. 31, T. 37 N., R. 20 E.

A2—0 to 2 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate thin platy

structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine and very fine pores; many unstained silt and sand grains; vesicular surface crust about 1/4 inch thick on surface; neutral; abrupt smooth boundary.

B21t—2 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium columnar structure; extremely hard, very firm, sticky and plastic; common to many fine roots mainly along faces of peds with few roots in matrix; few very fine pores; light gray coating of unstained grains of silt and sand on top of columns; common thin continuous clay films on faces of peds; mildly alkaline; clear wavy boundary.

B22t—5 to 11 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; extremely hard, very firm, sticky and plastic; common fine roots mainly along faces of peds; few fine pores; common thin continuous clay films on faces of peds; moderately alkaline; gradual wavy boundary.

B3cacs—11 to 20 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium angular and subangular blocky; very hard, firm, sticky and plastic; common to few fine roots; common fine and very fine pores; few fine soft masses of lime; few seams and crystals of gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

C1cs—20 to 40 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; few fine roots; common fine threads and crystals of gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

C2—40 to 60 inches; light olive brown (2.5Y 5/4) clay loam with thin lenses of loam and silty clay loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine seams of gypsum; strongly effervescent; moderately alkaline.

In cultivated areas, the surface layer is clay loam. The B horizon is clay or silty clay. The depth to accumulated gypsum ranges from 10 to 15 inches. The C horizon is moderately alkaline to strongly alkaline. The C horizon, to a depth of 40 inches, is 35 to 50 percent clay. Below 40 inches the texture is clay loam, clay, or silty clay.

Assinniboine series

The Assinniboine series consists of deep, well drained soils that formed in alluvium or eolian material. These soils are on glaciated uplands at an elevation of 2,500 to 3,500 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 14 inches, and the average

annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Assinniboine fine sandy loam, in an area of abandoned cropland, 2,200 feet west and 1,000 feet north of the SE corner of sec. 7, T. 36 N., R. 20 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure parting to weak very fine granular; slightly hard, very friable, slightly sticky and nonplastic; common fine roots; neutral; clear smooth boundary.

B1—5 to 9 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common fine roots; many medium and fine pores; neutral; clear smooth boundary.

B21t—9 to 18 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many medium and fine pores; few patchy clay films on vertical faces of peds; neutral; clear wavy boundary.

B22t—18 to 21 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine roots; common medium and fine pores; few patchy clay films on vertical faces of peds; mildly alkaline; clear smooth boundary.

C1ca—21 to 32 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2ca—32 to 60 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common fine threads and soft masses of lime; violently effervescent; moderately alkaline.

The depth to carbonates ranges from 14 to 22 inches. The substratum is mainly sandy loam or fine sandy loam. In some pedons there are thin lenses of loamy sand below a depth of 30 inches. Also, in some pedons, instead of a B1 horizon there is a B3 horizon.

Attewan series

The Attewan series consists of deep, well drained soils that formed in alluvium. These soils are on upland terraces at an elevation of 2,400 to 3,600 feet. Slopes

are 0 to 4 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Attewan loam, in a cultivated field, 2,000 feet south and 900 feet west of NE corner of sec. 29, T. 37 N., R. 26 E.

- Ap—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; 5 percent pebbles, by volume; neutral; clear smooth boundary.
- B2t—6 to 15 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium prismatic structure parting to strong fine and medium angular blocky; hard, friable, sticky and plastic; many fine roots; common fine and very fine pores; dark grayish brown (10YR 3/2) common thin clay films on faces of peds; 5 percent pebbles, by volume; mildly alkaline; clear smooth boundary.
- B3ca—15 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium angular and subangular blocky; hard, very friable, slightly sticky and plastic; common fine roots; many fine and very fine pores; 5 percent pebbles, by volume; common light gray (2.5Y 7/2) soft masses and threads of lime; violently effervescent; moderately alkaline; gradual wavy boundary.
- C1ca—20 to 25 inches; light brownish gray (2.5Y 6/2) light clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 10 percent pebbles, by volume; many soft masses of lime and lime coats on pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.
- IIC2—25 to 60 inches; grayish brown (2.5Y 5/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, about 60 percent pebbles and a few cobbles, by volume; lime crusts on underside of pebbles in upper part; strongly effervescent; moderately alkaline.

The combined thickness of the A and B horizons ranges from 12 to 20 inches. The B horizon is brown or grayish brown. It is mostly clay loam, but in some pedons it is sandy clay loam. The IIC horizon is very gravelly loamy sand or very gravelly sand. The depth to the IIC horizon ranges from 20 to 40 inches.

Barkof series

The Barkof series consists of moderately deep, well drained soils that formed in material that weathered from clayey shale. These soils are on uplands at an elevation

of 2,500 to 4,400 feet. They are underlain by platy shale at a depth of 20 to 40 inches. Slopes are 2 to 25 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 100 to 120 days.

Typical pedon of Barkof clay, in native grass, 150 feet west and 30 feet south of the NE corner of sec. 14, T. 26 N., R. 23 E.

- A1—0 to 7 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; very hard, very firm, sticky and very plastic; a 1/8-inch crust forms on the surface when the soil material is dry; many very fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.
- B2—7 to 24 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium and coarse subangular blocky; very hard, very firm, sticky and very plastic; many very fine roots in upper part decreasing to few very fine roots in the lower part; few very fine pores; few distinct slickensides; strongly effervescent; strongly alkaline; gradual smooth boundary.
- B3—24 to 28 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak medium prismatic structure; very hard, very firm, sticky and very plastic; few fine roots; about 20 percent weathered shale chips, by volume; slightly effervescent; moderately alkaline; gradual wavy boundary.
- Cr—28 to 60 inches; gray (5Y 5/1) platy shale that rubs to clay and clay loam, dark gray (5Y 4/1) moist; few fine roots in upper few inches; slightly effervescent; moderately alkaline.

The A horizon is dark grayish brown, grayish brown, or olive gray. The A horizon is mildly or moderately alkaline, and the B horizon is moderately or strongly alkaline. There are a few distinct slickensides or pressure faces in the B2 horizon. In some C horizons, threads and soft masses of gypsum range from few to common.

Bascovy series

The Bascovy series consists of moderately deep, well drained soils that formed in material that weathered from clayey shale. These soils are on uplands at an elevation of 2,400 to 3,600 feet. They are underlain by platy shale at a depth of 20 to 40 inches. Slopes are 2 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Bascovy clay, in native grass, 2,340 feet north and 150 feet west of the SE corner of sec. 17, T. 25 N., R. 21 E.

- A1—0 to 6 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium

and fine subangular blocky structure; extremely hard, firm, very sticky and very plastic; common fine and medium roots; few fine pores; thin light brownish gray (2.5Y 6/2) vesicular crust 1/4 inch thick on the surface; few vertical cracks less than 1/2 inch wide; slightly effervescent in spots; moderately alkaline; clear smooth boundary.

B21—6 to 10 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate medium and fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few fine pores; few vertical cracks less than 1/4 inch wide; mildly alkaline; gradual smooth boundary.

B22cs—10 to 15 inches; olive gray (5Y 5/2) clay, olive gray (5Y 5/2) moist; moderate medium and fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few fine pores; few vertical cracks; few pressure faces or slickensides; few fine seams of gypsum; neutral; gradual wavy boundary.

C1—15 to 23 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak medium and fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; very few fine pores; few fine roots; about 15 percent shale chips, by volume, increasing with depth; medium acid; wavy boundary.

C2r—23 to 60 inches; olive gray and olive brown platy shale that rubs to clay texture; medium acid.

The surface to a depth of 1/4 inch to 1 inch is either a thin vesicular crust or it has fine granular structure. Clay content of the soil above the shale ranges from 45 to 60 percent. The C horizon contains a few fine threads or common soft masses of segregated gypsum crystals. The platy shale is neutral to strongly acid.

Bearpaw series

The Bearpaw series consists of deep, well drained soils that formed in glacial till. These soils are on glaciated uplands at an elevation of 2,600 to 3,800 feet. Slopes are 0 to 8 percent. The average annual precipitation is 13 to 17 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 100 to 125 days.

Typical pedon of Bearpaw clay loam, in native grass, 1,320 feet west and 1,200 feet south of the NE corner of sec. 8, T. 28 N., R. 22 E.

A1—0 to 3 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure parting to moderate fine and very fine granular; slightly hard, very friable, sticky and nonplastic; many fine roots; neutral; clear smooth boundary.

B1—3 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to

moderate fine subangular blocky; hard, friable, sticky and slightly plastic; many fine roots; common fine pores; mildly alkaline; clear smooth boundary.

B21t—5 to 10 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; strong medium and fine prismatic structure parting to moderate medium and fine angular blocky; very hard, friable, sticky and plastic; common to many fine and very fine roots; few to common fine and very fine pores; common thin continuous clay films on faces of peds; 5 percent pebbles, by volume; mildly alkaline; clear smooth boundary.

B22t—10 to 16 inches; grayish brown (10YR 5/2) clay loam, (10YR 4/2) moist; strong medium and fine prismatic structure parting to strong medium and fine angular blocky; very hard, friable, sticky and plastic; common fine and very fine roots; few to common fine and very fine pores; dark grayish brown (10YR 4/2) coats on faces of peds; common thin continuous clay films on faces of peds; 5 percent pebbles, by volume; mildly alkaline; clear wavy boundary.

B3tca—16 to 23 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium angular and subangular blocky; very hard, friable, sticky and plastic; common to few fine and very fine roots; few to common fine pores; few thin clay films on vertical faces of peds; 5 percent pebbles, by volume; few to common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C1ca—23 to 39 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, sticky and plastic; few very fine roots; common fine pores; 5 percent pebbles, by volume; common to many fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—39 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few very fine roots in the upper part; 5 percent pebbles, by volume; few to common fine and medium soft masses of lime; strongly effervescent; strongly alkaline.

The B2t horizon is heavy clay loam or light clay. It has moderate or strong grades of prismatic and blocky structure. Color ranges from dark brown to grayish brown. The C horizon has few or common threads and soft masses of gypsum in the lower part of some pedons. Depth to carbonates ranges from 10 to 18 inches.

Beaverell series

The Beaverell series consists of deep, well drained soils that formed in alluvium. The underlying material below a depth of 10 to 20 inches is very gravelly sand. Beaverell soils are on terraces in uplands at an elevation of 2,400 to 3,600 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Beaverell gravelly loam, in native grass, 30 feet north and 1,000 feet west of the SE corner of sec. 15, T. 35 N., R. 23 E.

- A1—0 to 3 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine granular structure parting to weak very fine granular; slightly hard, very friable, slightly sticky and nonplastic; many fine and very fine roots; many fine and medium pores; about 15 percent pebbles, by volume; neutral; clear smooth boundary.
- B21t—3 to 9 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky; hard, friable, sticky and slightly plastic; many fine and very fine roots; common fine and very fine pores; few thin discontinuous clay films on faces of peds; about 35 percent pebbles, by volume; neutral; clear smooth boundary.
- B22t—9 to 11 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many medium and fine pores; few thin discontinuous clay films on faces of peds; about 50 percent pebbles, by volume; lime coats on undersides of larger pebbles; neutral; clear wavy boundary.
- IIC1ca—11 to 17 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; common very fine roots; about 60 percent pebbles, by volume; lime coats on undersides of pebbles; strongly effervescent; mildly alkaline; gradual wavy boundary.
- IIC2—17 to 60 inches; brown (10YR 5/3) very gravelly sand, dark brown (10YR 4/3) moist; single grain, loose, nonsticky and nonplastic; about 60 percent pebbles, by volume; lime coats on undersides of pebbles; strongly effervescent; mildly alkaline.

The A horizon is brown or grayish brown. Depth to carbonates ranges from 6 to 12 inches. The combined thickness of the A and B horizons ranges from 10 to 14 inches. The upper part of the C horizon is gravelly or very gravelly loam, sandy loam, or loamy sand. The Cca horizon that consists of gravelly loam has a greater concentration of accumulated lime than that which

consists of very gravelly loamy sand. Depth to the IIC2 horizon is 10 to 20 inches.

Beaverton series

The Beaverton series consists of deep, well drained soils that formed in alluvium. These soils are on fans and terraces on uplands at an elevation of 2,800 to 4,200 feet. The underlying material, below a depth of 10 to 20 inches, is very gravelly loamy sand or very gravelly sand. Slopes are 2 to 8 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Beaverton gravelly loam, in native grass, 300 feet east and 2,600 feet south of the NW corner of sec. 26, T. 27 N., R. 19 E.

- A1—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; very soft, very friable, nonsticky and nonplastic; many fine roots; about 20 percent fine pebbles, by volume; mildly alkaline; clear smooth boundary.
- B2t—3 to 10 inches; dark brown (10YR 4/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine angular blocky; hard, friable, slightly sticky and slightly plastic; many fine roots; few fine pores; few thin clay films on faces of peds; 20 percent fine pebbles, by volume; mildly alkaline; clear smooth boundary.
- C1ca—10 to 20 inches; light gray (10YR 7/2) very gravelly light clay loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and nonplastic; common fine roots in upper part decreasing to few in lower part of horizon; few fine pores; about 35 percent pebbles, by volume; violently effervescent; about 40 percent calcium carbonate equivalent of fine-earth fraction; moderately alkaline; gradual wavy boundary.
- IIC2ca—20 to 60 inches; grayish brown (2.5Y 4/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; 55 percent pebbles, by volume; effervescent; moderately alkaline.

Depth to carbonates ranges from 7 to 10 inches. The color of the B horizon is dark grayish brown or brown. The lower part of the C horizon is very gravelly sand or very gravelly loamy sand.

Belain series

The Belain series consists of moderately deep, well drained soils that formed in material that weathered from igneous rock. These soils are on uplands and mountains at an elevation of 3,000 to 6,000 feet. They are underlain

by bedrock at a depth of 20 to 40 inches. Slopes are 2 to 45 percent. The average annual precipitation is 14 to 19 inches. The average annual temperature is 40 to 44 degrees F., and the growing season is 90 to 110 days.

Typical pedon of Belain loam, in native grass, 400 feet west and 300 feet south of the NE corner of sec. 29, T. 27 N., R. 18 E.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine roots; 5 percent subrounded pebbles, by volume; mildly alkaline; clear smooth boundary.

B21—4 to 11 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine pores; 10 percent angular pebbles, by volume; mildly alkaline; clear wavy boundary.

B22—11 to 15 inches; dark brown (10YR 4/3) gravelly light loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine pores; 20 percent angular pebbles, by volume; mildly alkaline; gradual wavy boundary.

C1—15 to 22 inches; brown (10YR 5/3) gravelly light loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine pores; 30 percent angular pebbles and angular cobbles, by volume; mildly alkaline; gradual wavy boundary.

C2—22 to 28 inches; brown (10YR 5/3) very gravelly light loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; many fine pores; 40 percent angular pebbles and angular cobbles, by volume; few lime coats on undersides of coarse fragments; mildly alkaline; abrupt irregular boundary.

R—28 inches; igneous bedrock; fractured upper few inches; few lime coats on rocks.

The mollic epipedon is 10 to 14 inches thick. The color of the B horizon ranges from dark brown to grayish brown. The C horizon is gravelly or very gravelly loam or very gravelly sandy loam. Hard rock is at a depth of 20 to 40 inches. A Cca horizon is present in some pedons.

Benz series

The Benz series consists of deep, well drained soils that formed in alluvium. These soils are on fans and terraces in valleys and on uplands at an elevation of

2,300 to 3,600 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 17 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Benz loam, in native grass, 1,500 feet west and 2,500 feet south of the NE corner of sec. 16, T. 31 N., R. 23 E.

A1—0 to 1/2 inch; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive crust; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; many fine pores; common unstained silt and sand grains; moderately alkaline; clear smooth boundary.

A12—1/2 inch to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common unstained silt and sand grains; common fine and very fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—3 to 13 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; slightly effervescent; strongly alkaline; clear wavy boundary.

C2cs—13 to 41 inches; grayish brown (2.5Y 5/2) stratified loam with thin lenses of fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak platy structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine pores; few fine threads of gypsum; slightly effervescent; strongly alkaline; clear wavy boundary.

C3—41 to 60 inches; grayish brown (2.5Y 5/2) stratified loam and clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and slightly plastic; few very fine roots; common very fine pores; slightly effervescent; very strongly alkaline.

The A horizon is light brownish gray, grayish brown, or brown. Its surface has a thin, slightly hard vesicular crust. If cultivated, the A horizon is hard when dry. The A horizon is neutral to strongly alkaline. The C horizon is strongly alkaline or very strongly alkaline.

Bowdoin series

The Bowdoin series consists of deep, moderately well drained soils that formed in alluvium. These soils are on flood plains and terraces in valleys at an elevation of 2,300 to 2,500 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Bowdoin clay, in abandoned cropland, 900 feet west and 500 feet south of the NE corner of sec. 36, T. 31 N., R. 25 E.

- Ap—0 to 6 inches; gray (5Y 5/1) clay, olive gray (5Y 4/2) moist; weak fine subangular blocky structure; the surface in the uppermost 1/2 inch separates to strong coarse granules; extremely hard, very firm, very sticky and very plastic; common fine roots; slightly effervescent; moderately alkaline; abrupt wavy boundary.
- C1—6 to 34 inches; gray (5Y 5/1) clay, olive gray (5Y 4/2) moist; massive; extremely hard, very firm, very sticky and very plastic; common fine roots in the upper part and few fine roots in the lower part; few very fine and fine pores; when dry, cracks about 1 inch wide appear in the upper part; few fine threads of gypsum in the lower part; slightly effervescent; moderately alkaline; clear wavy boundary.
- C2—34 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and very plastic; few to common fine threads and soft medium masses of gypsum; few fine light olive brown (2.5Y 5/6) mottles; slightly effervescent; moderately alkaline.

The A horizon is olive gray or grayish brown. Few to many threads and soft masses of gypsum and salts occur in the C horizon. Exchangeable sodium ranges from 15 to 30 percent in the C horizon. In some profiles, there are thin strata of silt loam or silty clay loam at a depth below 40 inches.

Cabba series

The Cabba series consists of shallow, well drained soils that formed in material that weathered from soft sedimentary beds. These soils are on uplands at an elevation of 3,200 to 4,500 feet. They are underlain by soft sedimentary beds at a depth of 10 to 20 inches. Slopes are 8 to 45 percent. The average annual precipitation is 14 to 18 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Cabba loam, in native grass, 1,200 feet south and 200 feet east of the NW corner of sec. 23, T. 26 N., R. 23 E.

- A1—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; soft, very friable, slightly sticky and nonplastic; many medium and very fine roots; mildly alkaline; clear smooth boundary.
- C1—3 to 8 inches; olive (5Y 5/3) loam, olive (5Y 4/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; many fine and very fine roots; common fine and medium pores; slightly effervescent; mildly alkaline; clear smooth boundary.

C2—8 to 12 inches; pale olive (5Y 6/3) loam, olive (5Y 5/3) moist; weak medium and thin platy structure; slightly hard, very friable, nonsticky and nonplastic; common fine roots; few pores; 10 percent soft fine shale chips, by volume; slightly effervescent; mildly alkaline; clear wavy boundary.

C3r—12 to 60 inches; olive gray (5Y 5/2) and pale olive (5Y 6/3) platy soft siltstone that rubs to loam, silt loam, or clay loam; few to common fine roots in upper part.

The A1 horizon is brown, grayish brown, or dark grayish brown. The sedimentary beds are at a depth that ranges from 10 to 20 inches. They consist mainly of soft siltstone but include strata of soft sandstone and soft shale.

Cabbart series

The Cabbart series consists of shallow, well drained soils that formed in material that weathered from soft sedimentary beds. These soils are on uplands at an elevation of 2,300 to 3,800 feet. They are underlain by soft sedimentary beds at a depth of 10 to 20 inches. Slopes are 2 to 60 percent. The average annual precipitation is 10 to 14 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Cabbart loam, in native grass, 700 feet south and 800 feet east of the NW corner of sec. 21, T. 27 N., R. 21 E.

- A1—0 to 4 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many medium and fine roots; common fine pores; slightly effervescent; mildly alkaline; clear smooth boundary.
- C1—4 to 12 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C2r—12 to 60 inches; light brownish gray (2.5Y 6/2), and light olive brown (2.5Y 5/4) in thin layers, soft siltstone that rubs to loam, silt loam, or clay loam, grayish brown (2.5Y 5/2) moist; few fine roots in upper part; few fine soft threads of lime; strongly effervescent.

The A horizon is grayish brown to light olive brown. The C1 horizon is grayish brown, light yellowish brown, or light olive brown. Soft sedimentary beds are at a depth of 10 to 20 inches. They consist mainly of soft siltstone but include strata of soft sandstone and soft shale.

Castner series

The Castner series consists of shallow, well drained soils that formed in material that weathered from hard sandstone and igneous rock. These soils are on uplands and mountains at an elevation of 3,000 to 6,000 feet. They are underlain by hard rock at a depth of 10 to 20 inches. Slopes are 8 to 60 percent. The average annual precipitation is 14 to 19 inches, and the average annual temperature is 40 to 44 degrees F. The growing season is 90 to 110 days.

Typical pedon of Castner gravelly loam, in native grass, 400 feet north and 2,000 feet east of the SW corner of sec. 1, T. 28 N., R. 20 E.

- A1—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; many fine pores; about 15 percent small angular pebbles, by volume; neutral; clear smooth boundary.
- C—6 to 13 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and medium roots; many fine pores; about 50 percent, by volume, angular gravel and 20 percent angular cobbles; mildly alkaline; gradual wavy boundary.
- R—13 inches; hard sandstone.

The A horizon is dark grayish brown or dark brown. Lime has accumulated in the lower part of the C horizons in some areas. The R horizon is hard sandstone or igneous rock.

Chinook series

The Chinook series consists of deep, well drained soils that formed in alluvial or eolian material. These soils are on glaciated uplands at an elevation of 2,500 to 3,500 feet. Slopes are 2 to 12 percent. The average annual precipitation is 10 to 14 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Chinook fine sandy loam, in a cultivated field, 600 feet west and 1,000 feet south of the NE corner of sec. 25, T. 37 N., R. 19 E.

- Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine roots; many fine and medium pores; neutral; clear smooth boundary.
- B2—6 to 12 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable,

nonsticky and nonplastic; common fine roots; many fine and medium pores; neutral; gradual smooth boundary.

- B3—12 to 16 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; soft, very friable, nonsticky and nonplastic; common fine roots; many fine and medium pores; mildly alkaline; gradual wavy boundary.
- C1ca—16 to 54 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine roots in upper part grading to few very fine roots in lower part; common fine and medium pores; strongly effervescent; moderately alkaline; clear wavy boundary.
- C2—54 to 60 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; very few very fine roots; many fine pores; few fine soft masses of lime; slightly effervescent; mildly alkaline.

The depth to carbonates ranges from 10 to 18 inches.

Cozberg series

The Cozberg series consists of deep, well drained soils that formed in alluvial or eolian material. These soils are on outwash terraces on glaciated uplands at an elevation of 2,500 to 3,500 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 14 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Cozberg fine sandy loam, in a cultivated field, 1,000 feet south and 400 feet east of the NW corner of sec. 26, T. 35 N., R. 25 E.

- Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots; many fine and medium pores; neutral; clear wavy boundary.
- B21—7 to 12 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine pores; neutral; clear wavy boundary.
- B22—12 to 20 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and medium pores; mildly alkaline; clear wavy boundary.
- B3—20 to 26 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse

prismatic structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; common fine pores; 5 percent pebbles, by volume; few lime coats on pebbles; slightly effervescent; mildly alkaline; abrupt wavy boundary.

II C1ca—26 to 30 inches; light brownish gray (2.5Y 6/2) gravelly loamy sand, grayish brown (2.5Y 5/2) moist; single grain; loose; few fine and very fine roots; few fine and very fine pores; 20 percent pebbles, by volume; lime disseminated as large soft masses and as lime coats on pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

II C2—30 to 60 inches; pale brown (10YR 6/3) stratified loamy sand and strata of sand, brown (10YR 5/3) moist; single grain; loose; few very fine roots; common fine pores; 10 percent fine pebbles, by volume; strongly effervescent; moderately alkaline.

The mollic epipedon is 7 to 14 inches thick. Depth to carbonates ranges from 16 to 28 inches. The C horizon is mostly loamy sand, sand, or gravelly loamy sand.

Creed series

The Creed series consists of deep, well drained soils that formed in alluvium. These soils are on uplands at an elevation of 2,400 to 3,800 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 15 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Creed loam, in native grass, 1,550 feet west and 2,630 feet south of the NE corner of sec. 12, T. 35 N., R. 20 E.

A1—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to weak fine and very fine granular; slightly hard, very friable, slightly sticky and nonplastic; many fine roots; common fine pores; common unstained grains of sand; mildly alkaline; clear smooth boundary.

A2—5 to 6 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; weak thin platy structure parting to weak fine and very fine granular; slightly hard, very friable, slightly sticky and nonplastic; many fine roots; common fine pores; many unstained grains of silt and sand; mildly alkaline; abrupt wavy boundary.

B21t—6 to 8 inches; grayish brown (2.5Y 5/2) light silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium columnar structure parting to strong medium and fine angular blocky; very hard, firm, very sticky and plastic; common fine roots along prism faces; common to few very fine pores; moderately thick and thin films of clay on faces of peds; light gray (10YR 7/2) skeletons on top of columns, and common unstained sand and silt grains on vertical faces of peds; mildly alkaline; clear wavy boundary.

B22t—8 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong medium and fine angular blocky; very hard, firm, very sticky and plastic; common fine roots; common to few very fine pores; thin continuous clay films; moderately alkaline; clear wavy boundary.

B3ca—12 to 16 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; thin discontinuous films of clay on vertical faces of peds; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1ca—16 to 28 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; few to common fine and very fine roots; common fine and very fine pores; common soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

C2cs—28 to 60 inches; light brownish gray and light yellowish brown (2.5Y 6/2 and 2.5Y 6/4 mixed) silty clay loam and lenses of loam, dark grayish brown (2.5Y 4/2) moist; stratified; hard, friable, sticky and slightly plastic; few to common fine seams of gypsum; strongly effervescent; moderately alkaline.

Depth to carbonates ranges from 11 to 22 inches. The A horizon is 5 to 8 inches thick. The B horizon is silty clay loam, silty clay, or clay. The C horizon is silty clay loam or clay loam stratified with loam or sandy clay loam. There are few to many fine seams or soft masses of gypsum in the lower part of the C horizon.

Delpoint series

The Delpoint series consists of moderately deep, well drained soils that formed in material that weathered from soft sedimentary beds. These soils are on uplands at an elevation of 2,300 to 3,800 feet. They are underlain by soft siltstone beds at a depth of 20 to 40 inches. Slopes are mostly 2 to 15 percent. The average annual precipitation is 10 to 14 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Delpoint loam, in native grass, 1,400 feet north and 10 feet west of the SE corner of sec. 20, T. 27 N., R. 21 E.

A1—0 to 4 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; common fine pores; mildly alkaline; clear smooth boundary.

B2—4 to 8 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; many fine roots; common fine pores; slightly effervescent; mildly alkaline; clear smooth boundary.

B3ca—8 to 16 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C1ca—16 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; few to common fine and very fine roots; few fine and very fine pores; few to common fine fragments of shale in the lower part; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2r—32 to 60 inches; grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/3) soft siltstone that rubs to loam, silt loam, or clay loam.

The A horizon is grayish brown, dark brown, or brown. The C horizon is grayish brown, brown, pale brown, or light yellowish brown or light brownish gray. The C horizon is silty clay loam, loam, or clay loam; it has a few soft masses of lime in some pedons. The depth to soft siltstone ranges from 20 to 40 inches. The soft sedimentary beds consist mainly of soft siltstone but include strata of soft sandstone and soft shale.

Dimmick series

The Dimmick series consists of shallow, well drained soils that formed in clayey material that weathered from acid shale. These soils are on uplands at an elevation of 2,300 to 4,000 feet. They are underlain by shale at a depth of 10 to 20 inches. Slopes are 4 to 45 percent. The average annual precipitation is 12 to 15 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Dimmick clay, in native grass, 1,050 feet north and 150 feet west of the SE corner of sec. 34, T. 25 N., R. 17 E.

A11—0 to 1/4 inch; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive crust; hard, friable, sticky and plastic; few fine roots; neutral; abrupt smooth boundary.

A12—1/4 inch to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; very hard, firm, sticky and plastic; few fine roots; common medium and fine pores; slightly acid; clear smooth boundary.

C1—3 to 7 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; common fine and very fine pores; few fine seams and threads of gypsum; medium acid; gradual smooth boundary.

C2—7 to 16 inches; grayish brown (2.5Y 5/2) shaly clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; few fine roots; common very fine pores; about 30 percent weathered shale fragments, by volume; few threads and seams of gypsum in upper part; strongly acid; gradual wavy boundary.

C3r—16 to 60 inches; grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) platy shale that rubs to clay or clay loam; strongly acid.

In some pedons there is no thin vesicular crust. The Cr horizon ranges from medium acid to very strongly acid. The depth to this horizon ranges from 10 to 20 inches.

Dimmick series

The Dimmick series consists of deep, very poorly drained soils that formed in clayey alluvium. These soils are in depressions or undrained small basins on glaciated uplands at an elevation of 2,500 to 3,800 feet. Slopes are 0 to 1 percent. The average annual precipitation is 12 to 16 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Dimmick clay, in native grass, 1,300 feet east and 1,150 feet south of NW corner of sec. 29, T. 37 N., R. 22 E.

O1—2 inches to 0; partially decomposed plant litter.

A11g—0 to 5 inches; gray (5Y 5/2) clay, very dark gray (5Y 3/1) moist; many very fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine angular blocky structure; very hard, firm, very sticky and very plastic; many fine and medium roots; few fine pores; neutral; gradual smooth boundary.

A12g—5 to 22 inches; gray (5Y 5/1) clay, very dark gray (5Y 3/1) moist; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium and fine angular blocky structure; very hard, firm, very sticky and very plastic; common medium roots; common fine pores; mildly alkaline; gradual smooth boundary.

C1g—22 to 36 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; few medium faint olive brown (2.5Y 5/6) mottles; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; few roots; common fine pores; mildly alkaline; gradual wavy boundary.

C2g—36 to 60 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; few medium faint light olive brown (2.5Y 5/6) mottles; massive; hard, firm, very sticky and

very plastic; few very fine roots; few fine pores; slightly effervescent; mildly alkaline.

The A horizon is gray or dark gray. Depth to carbonates ranges from 30 to 66 inches. There are few faint to many distinct mottles throughout the pedon.

Elloam series

The Elloam series consists of deep, well drained soils that formed in glacial till. These soils are on glaciated uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 15 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Elloam clay loam, in native grass, 450 feet north and 150 feet east of the SW corner of sec. 36, T. 36 N., R. 19 E.

A2—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy structure parting to moderate very fine granular; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common very fine and fine pores; many unstained silt and sand grains; slightly acid; clear wavy boundary.

B21t—3 to 7 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong fine and medium columnar structure parting to moderate fine and medium angular blocky; very hard, firm, very sticky and very plastic; common very fine and fine roots along faces of peds; many very fine and fine tubular pores; many light gray (10YR 7/2) skeletons capping columns and on vertical faces of peds; common moderately thick films of clay on faces of peds; neutral; clear wavy boundary.

B22t—7 to 9 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; very hard, firm, very sticky and very plastic; common fine and very fine roots on faces of peds; many fine and very fine tubular pores; common moderately thick films of clay on faces of peds and lining pores; moderately alkaline; clear wavy boundary.

B3ca—9 to 17 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse prismatic structure parting to weak medium and coarse subangular and angular blocky; very hard, friable, sticky and plastic; common very fine and fine roots; common fine and medium pores; 5 percent pebbles, by volume; few soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1ca—17 to 28 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to weak

medium and coarse subangular blocky; very hard, friable, sticky and plastic; few very fine and fine roots; few fine and medium pores; 5 percent pebbles, by volume; many fine to coarse soft masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

C2cacs—28 to 39 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, friable, sticky and plastic; few fine and very fine roots; few fine and medium pores; 5 percent pebbles, by volume; common soft masses of lime; common soft threads and fine masses of gypsum crystals; violently effervescent; moderately alkaline; gradual wavy boundary.

C3cacs—39 to 51 inches; olive (5Y 5/3) clay loam, olive gray (5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine pores; 5 percent pebbles, by volume; many fine threads and crystals of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

C4cs—51 to 62 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few very fine roots; few very fine and fine pores; 5 percent pebbles, by volume; slightly effervescent; moderately alkaline.

The A2 horizon is 1 to 4 inches thick. The B2t horizon is 35 to 45 percent clay; it has 10 to 20 percent exchangeable sodium. The C horizon has 15 to 25 percent exchangeable sodium. It is moderately or strongly alkaline.

Ethridge series

The Ethridge series consists of deep, well drained soils that formed in alluvium. These soils are on fans and stream terraces on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 4 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Ethridge silty clay loam, in cropland, 1,000 feet north and 10 feet east of the SW corner of sec. 1, T. 35 N., R. 20 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; moderate fine granular structure; hard, friable, sticky and plastic; common fine roots; common unstained grains of silt and sand; neutral; clear wavy boundary.

B21t—6 to 13 inches; dark brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium and fine angular blocky; very hard, firm, very sticky and

plastic; common fine roots; common very fine pores; dark grayish brown (10YR 4/2) continuous thin films of clay on faces of peds; few unstained grains of sand on vertical faces of peds; mildly alkaline; clear wavy boundary.

B22tca—13 to 20 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong fine and medium angular and subangular blocky; very hard, firm, very sticky and plastic; common very fine roots; common very fine pores; continuous thin clay films; slightly effervescent; moderately alkaline; clear boundary.

C1ca—20 to 28 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few fine roots; common fine and very fine pores; thin films of clay on vertical faces of peds; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear boundary.

C2—28 to 42 inches; grayish brown (2.5Y 5/2) loam and thin lenses of sandy loam and silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine roots; common fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear boundary.

C3cs—42 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; few and common fine seams of gypsum; strongly effervescent; moderately alkaline.

The A horizon in grassland is 1 to 3 inches thick and is loam or silt loam. The B horizon is grayish brown, brown, or dark brown silty clay loam or silty clay. The combined thickness of the A and B horizons is 14 to 24 inches. Stratification is common in the C horizon below a depth of 30 inches. The C horizon is moderately alkaline or strongly alkaline. Soft masses and threads or seams of gypsum are below a depth of 40 inches.

Farnuf series

The Farnuf series consists of deep, well drained soils that formed in alluvium. These soils are on fans and stream terraces on uplands at an elevation of 2,500 to 4,500 feet. Slopes are 0 to 8 percent. The average annual precipitation is 13 to 18 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 100 to 120 days.

Typical pedon of Farnuf loam, in native grass, 600 feet east and 1,300 feet north of the SW corner of sec. 33, T. 29 N., R. 19 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate

medium and fine granular structure; hard, very friable, sticky and slightly plastic; many fine and very fine roots; common fine pores; neutral; clear wavy boundary.

B21t—5 to 13 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and fine angular and subangular blocky; very hard, firm, sticky and plastic; many fine and very fine roots; many fine and very fine pores; common thin clay films; mildly alkaline; clear wavy boundary.

B22t—13 to 20 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium and fine angular and subangular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; many fine and very fine pores; common thin clay films; mildly alkaline; clear wavy boundary.

B3ca—20 to 24 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; many fine and very fine pores; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1ca—24 to 36 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and slightly plastic; few fine and very fine roots; many fine and very fine pores; many soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C2ca—36 to 60 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and slightly plastic; common soft masses of lime; violently effervescent; moderately alkaline.

The depth to carbonates ranges from 10 to 20 inches. The combined A and B horizons are 14 to 28 inches thick. The A horizon is dark grayish brown or dark brown. The B2 horizon is 28 to 35 percent clay. The C horizon in some pedons is 5 to 15 percent gravel and is stratified with thin lenses of silt loam, loam, and sandy clay loam.

Gerdrum series

The Gerdrum series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and fans on uplands at an elevation of 2,300 to 4,200 feet. Slopes are 0 to 4 percent. The average annual precipitation is 12 to 17 inches, and the average temperature is 41 to 45 degrees F. The growing season is 100 to 125 days.

Typical pedon of Gerdrum clay loam, in native grass, 1,740 feet north and 50 feet east of the SW corner of sec. 8, T. 25 N., R. 18 E.

- A1—0 to 2 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak thin platy structure parting to weak very fine granular; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; many unstained silt and sand grains; soft very thin vesicular crust on surface; neutral; clear smooth boundary.
- A2—2 to 4 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and nonplastic; common fine roots; many very fine vesicular pores; many unstained sand and silt grains on cleavage plates; neutral; abrupt wavy boundary.
- B21t—4 to 7 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong fine and medium columnar structure parting to moderate medium and fine angular and subangular blocky; extremely hard, firm, sticky and plastic; few fine roots along faces of peds and few very fine roots in matrix; few very fine tubular pores; light gray (10YR 7/2) coats of unstained grains of sand and silt on top of columns; dark grayish brown (10YR 4/2) coats on vertical faces of peds; thin continuous clay films; mildly alkaline; clear smooth boundary.
- B22t—7 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong fine and medium prismatic structure parting to strong medium and fine angular blocky; extremely hard, firm, sticky and plastic; few fine and very fine roots along faces of peds and few very fine roots in matrix; few very fine tubular pores; dark grayish brown (10YR 4/2) coats on vertical faces of peds; thin continuous clay films; mildly alkaline; clear wavy boundary.
- B31tca—14 to 22 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium prismatic structure parting to moderate fine and medium angular and subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; thin discontinuous clay films on vertical faces of peds; common soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.
- B32cacs—22 to 36 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; few very fine pores; common soft masses of lime; common soft masses and seams of gypsum; violently effervescent; moderately alkaline; clear wavy boundary.
- C1cacs—36 to 46 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; very few very fine roots; very few very fine pores; few to common soft masses of lime; common soft masses and seams of

gypsum; violently effervescent; moderately alkaline; clear irregular boundary.

- II C2ca—46 to 68 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; hard, very friable, slightly sticky and nonplastic; about 25 percent pebbles, by volume; lime disseminated throughout and as crusts on underside of coarse fragments and as seams; strongly effervescent; moderately alkaline.

The depth to carbonates ranges from 12 to 17 inches. In some pedons there is no A1 horizon. The B2t horizon is 40 to 60 percent clay.

Glendive series

The Glendive series consists of deep, well drained soils that formed in alluvium. These soils are on flood plains and low stream terraces in valleys at an elevation of 2,300 to 3,500 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F. The growing season is 105 to 125 days.

Typical pedon of Glendive fine sandy loam, in a cultivated field, 800 feet north and 500 feet east of the SW corner of sec. 21, T. 33 N., R. 18 E.

- Ap—0 to 7 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots and few medium roots; slightly effervescent; mildly alkaline; clear smooth boundary.
- C1—7 to 24 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots and few medium roots; common medium pores; slightly effervescent; mildly alkaline; clear wavy boundary.
- C2—24 to 27 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and medium roots; few fine pores; strongly effervescent; mildly alkaline; abrupt wavy boundary.
- C3—27 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium roots; few fine pores; strongly effervescent; mildly alkaline.

The A horizon is 6 to 8 inches thick. The C horizon is mostly fine sandy loam with strata of loamy sand and loam. The C horizon is mildly alkaline to strongly alkaline.

Hanly series

The Hanly series consists of deep, well drained soils that formed in alluvium. These soils are on flood plains and stream terraces in valleys at an elevation of 2,300 to 3,500 feet. Slopes are 0 to 4 percent. The average annual precipitation is 11 to 14 inches. The average annual temperature is 42 to 46 degrees F. The growing season is 105 to 125 days.

Typical pedon of Hanly loamy fine sand, in native vegetation, 1,200 feet north and 2,400 feet east of the SW corner of sec. 21, T. 33 N., R. 18 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine roots; few coarse roots; thin litter of leaves and grass stems on surface; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—3 to 28 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grain; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; strongly effervescent; mildly alkaline; clear irregular boundary.

C2—28 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grain; soft, very friable, nonsticky and nonplastic; few coarse roots; 2-inch lenses of fine sandy loam in upper part; strongly effervescent; mildly alkaline.

The A horizon is light brownish gray or grayish brown. The C horizon is mostly loamy fine sand with thin strata of sand and fine sandy loam.

Harlem series

The Harlem series consists of deep, well drained or moderately well drained soils that formed in alluvium. These soils are on flood plains and stream terraces in valleys at an elevation of 2,300 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Harlem silty clay loam, in irrigated cropland, 300 feet north and 2,490 feet west of the SE corner of sec. 21, T. 32 N., R. 23 E.

Ap—0 to 10 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; very hard, firm, sticky and plastic; many fine and few medium roots; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C1—10 to 24 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist;

moderate medium and fine subangular blocky structure; very hard, firm, sticky and plastic; many fine and few medium roots; many fine to coarse pores; few thin lenses of silt loam and silty clay; few fine crystals of salts; slightly effervescent; moderately alkaline; diffuse wavy boundary.

C2—24 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine granular structure; very hard, firm, sticky and plastic; common fine and few medium roots; common fine pores; thin lenses of silt loam and silty clay; few fine crystals of salts; moderately alkaline; clear wavy boundary.

C3—46 to 60 inches; brown (10YR 5/3) stratified silt loam and loam, thin lenses of fine sandy loam and silty clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine pores; strongly effervescent; moderately alkaline.

The A horizon is loam, silty clay loam, or silty clay. The 10- to 40-inch depth control section is mostly silty clay loam or silty clay. Below a depth of 30 inches, the C horizon is stratified with thin lenses that range in texture from fine sandy loam to silty clay.

Harlem Variant

The Harlem Variant consists of deep, somewhat poorly drained, strongly saline and moderately sodium-affected soils that formed in alluvium. These soils are on flood plains and stream terraces in valleys at an elevation of 2,300 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Harlem Variant silty clay loam, in irrigated cropland, 1,320 feet west and 2,000 feet north of the SE corner of sec. 10, T. 32 N., R. 21 E.

Ap—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, friable, sticky and plastic; many fine roots and few medium roots; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C1—7 to 28 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; many fine roots and few medium roots; common fine pores; few thin lenses of loam; few fine salt crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

C2sa—28 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) mottles; massive; hard, friable, sticky and plastic; few fine

roots; common fine pores; common fine salt crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

C3sa—44 to 60 inches; grayish brown (2.5Y 5/2) stratified silty clay loam, silt loam, and loam; dark grayish brown (2.5Y 4/2) moist; many medium distinct yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) mottles; stratified; hard, friable, sticky and slightly plastic; few fine pores; many fine seams and crystals of salts; strongly effervescent; moderately alkaline.

The 10- to 40-inch control section is 35 to 50 percent clay. The C horizon is moderately or strongly affected by sodium. Mottles occur at a depth of 24 to 40 inches. Depth to saturated soil or a water table ranges from 2 to 4 feet. The strata of loam, clay loam, or silty clay are at a depth below 40 inches. Reaction is moderately alkaline or strongly alkaline throughout the pedon.

Havre series

The Havre series consists of deep, well drained soils that formed in alluvium. These soils are on flood plains and stream terraces in valleys at an elevation of 2,300 to 3,500 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Havre loam, in irrigated cropland, 1,050 feet north and 2,640 feet east of the SW corner of sec. 33, T. 32 N., R. 23 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak granular structure; soft, very friable, slightly sticky and slightly plastic; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C1—8 to 36 inches; light brownish gray (2.5Y 6/2) loam; thin lenses of fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common to many medium and fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—36 to 60 inches; light brownish gray (2.5Y 6/2) loam; thin lenses of fine sandy loam and silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; common medium and fine pores; strongly effervescent; moderately alkaline.

The A horizon is loam or silty clay loam. The C horizon is mostly loam stratified with lenses that range from fine sandy loam to clay loam. These soils are mildly alkaline or moderately alkaline.

Havre Variant

The Havre Variant consists of deep, somewhat poorly drained soils that are strongly saline and moderately affected by sodium. The soils formed in alluvium. These soils are on flood plains and stream terraces in valleys at an elevation of 2,300 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Havre Variant silty clay loam, in irrigated cropland, 500 feet west and 1,350 feet south of the NW corner of sec. 2, T. 22 N., R. 20 E.

Ap—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, very friable, sticky and slightly plastic; many fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—7 to 19 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, sticky and slightly plastic; many fine roots; common fine pores; few thin lenses of loam and fine sandy loam; few fine salt crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

C2sa—19 to 38 inches; light brownish gray (2.5Y 6/2) loam; lenses of fine sandy loam and silty clay loam, grayish brown (2.5Y 5/2) moist; common fine distinct yellowish brown (2.5Y 5/4) and light brownish gray (2.5Y 6/2) mottles; stratified; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; common fine pores; common fine salt crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

C3sa—38 to 60 inches; light brownish gray (2.5Y 6/2) loam; lenses of silt loam and fine sandy loam, grayish brown (2.5Y 5/2) moist; many medium distinct yellowish brown (2.5Y 5/4) and light gray (2.5Y 7/2) mottles; stratified; slightly hard, very friable, slightly sticky and slightly plastic; few fine pores; many fine seams and crystals of salt; strongly effervescent; moderately alkaline.

The A horizon is grayish brown or brown. The 10- to 40-inch control section on the average is 18 to 35 percent clay. The C horizon is moderately or strongly affected by sodium. Mottles are common below a depth of 24 to 40 inches. Depth to the seasonal water table or to saturated soil ranges from 2 to 4 feet. Reaction is moderately alkaline or strongly alkaline throughout the profile.

Hedoes series

The Hedoes series consists of deep, well drained soils that formed in colluvium and alluvium from igneous rock.

These soils are on fans, terraces, and foot slopes on uplands and mountains at an elevation of 3,000 to 6,000 feet. Slopes are 2 to 45 percent. The average annual precipitation is 14 to 19 inches. The average annual temperature is 40 to 44 degrees F., and the growing season is 90 to 110 days.

Typical pedon of Hedoes loam, in a pasture, 100 feet east and 2,640 feet north of the SW corner of sec. 3, T. 25 N., R. 19 E.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and nonplastic; many medium and fine roots; neutral; clear smooth boundary.

B21—4 to 9 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; common fine roots; common fine and very fine pores; about 5 percent fine pebbles, by volume; mildly alkaline; clear wavy boundary.

B22—9 to 17 inches; dark brown (10YR 4/3) light loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common fine roots; common fine pores; about 5 percent pebbles, by volume; mildly alkaline; clear wavy boundary.

C1ca—17 to 34 inches; grayish brown (10YR 5/2) coarse sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few fine pores; 10 percent fine pebbles, by volume; common fine soft masses and seams of lime; strongly effervescent; moderately alkaline; gradual irregular boundary.

IIC2—34 to 60 inches; grayish brown (10YR 5/2) very gravelly coarse sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; 50 percent pebbles, by volume; few cobbles; lime crusts on undersides of larger coarse fragments; strongly effervescent; moderately alkaline.

The A horizon is dark grayish brown, dark brown, or very dark grayish brown. The C horizon has few to many accumulations of soft masses of lime.

Hillon series

The Hillon series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 8 to 45 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Hillon clay loam, in native grass, 1,440 feet north and 600 feet west of the SW corner of sec. 17, T. 37 N., R. 26 E.

A1—0 to 4 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak thin platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many very fine pores; 5 percent pebbles, by volume; mildly alkaline; abrupt smooth boundary.

C1ca—4 to 12 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common fine roots; few very fine pores; 5 percent pebbles, by volume; violently effervescent; moderately alkaline; gradual wavy boundary.

C2ca—12 to 26 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure; hard, friable, sticky and plastic; common fine roots; few fine pores; 5 percent pebbles, by volume; common soft masses of lime; violently effervescent; moderately alkaline; gradual boundary.

C3—26 to 40 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; few fine roots; few very fine pores; 5 percent pebbles, by volume; common soft masses of lime; strongly effervescent; moderately alkaline; gradual boundary.

C4—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; hard, friable, sticky and plastic; 5 percent pebbles, by volume; strongly effervescent; moderately alkaline.

The A horizon is 2 to 4 inches thick. The C horizon is loam or clay loam; it is mildly alkaline to strongly alkaline.

Joplin series

The Joplin series consists of deep, well drained soils that formed in glacial till. These soils are on glaciated uplands at an elevation of 2,400 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Joplin loam, in a cultivated field, 1,000 feet north and 700 feet west of the SE corner of sec. 27, T. 36 N., R. 23 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; medium fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine roots and pores; 5 percent gravel, by volume; neutral; clear boundary.

B2t—6 to 9 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular and angular blocky; hard, friable, slightly

- sticky and slightly plastic; common fine roots; common fine pores; mildly alkaline; clear boundary.
- B3ca—9 to 16 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine pores; strongly effervescent; few to common masses of lime; moderately alkaline; gradual boundary.
- C1ca—16 to 31 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; strongly effervescent; common large masses of lime; moderately alkaline; gradual boundary.
- C2—31 to 60 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; hard, friable, slightly sticky and slightly plastic; few very fine roots in upper part; few very fine pores; strongly effervescent; few masses of lime; moderately alkaline; gradual boundary.

The A horizon is loam or gravelly loam. The noncalcareous solum ranges from 6 to 10 inches in depth. The underlying material is loam or clay loam; some pedons have thin lenses of sandy clay loam below a depth of 30 inches.

Judith series

The Judith series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and fans on uplands at an elevation of 3,200 to 4,500 feet. Slopes are 2 to 15 percent. The average annual precipitation is 14 to 19 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 100 to 120 days.

Typical pedon of Judith loam, in native grass, 2,060 feet west and 1,660 feet north of the SE corner of sec. 1, T. 25 N., R. 23 E.

- A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; many fine roots in upper part and common fine roots in lower part; slightly effervescent; mildly alkaline; clear irregular boundary.
- B2ca—5 to 10 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine granular; slightly hard, very friable, slightly sticky and nonplastic; common fine roots; common fine pores; 5 percent pebbles, by volume; violently effervescent; moderately alkaline; gradual wavy boundary.
- B3ca—10 to 33 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; weak medium

and coarse subangular blocky structure; hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine pores; 10 to 15 percent lime coated pebbles, by volume; violently effervescent; moderately alkaline; clear wavy boundary.

- II Cca—33 to 60 inches; very pale brown (10YR 7/3) very gravelly loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few fine roots in upper part; few fine pores; 40 percent lime coated pebbles, by volume; violently effervescent; moderately alkaline.

The A horizon is dark grayish brown or dark brown. An AC horizon is present in some pedons. The Cca horizon consists of 40 to 60 percent calcium carbonate equivalent. Coarse fragments make up 35 to 60 percent of the volume below a depth of 30 inches. The C horizon is moderately alkaline or strongly alkaline.

Kevin series

The Kevin series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 25 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Kevin clay loam, in native grass, 2,540 feet east and 400 feet north of the SW corner of sec. 5, T. 37 N., R. 26 E.

- A1—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine and very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt wavy boundary.
- B2t—3 to 8 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; strong medium prismatic structure parting to moderate medium angular and subangular blocky; very hard, firm, sticky and plastic; many roots; few fine roots; few fine pores; thin discontinuous clay films on vertical faces of peds; 5 percent pebbles, by volume; mildly alkaline; clear wavy boundary.
- B3ca—8 to 16 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; common fine pores; 5 percent pebbles, by volume; common masses of segregated lime; violently effervescent; mildly alkaline; gradual clear boundary.
- C1ca—16 to 30 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure parting to weak subangular blocky; very hard, firm, sticky and plastic; few fine roots; few fine pores; 5

percent pebbles, by volume; common soft masses of segregated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—30 to 43 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak very coarse prismatic structure; very hard, firm, sticky and plastic; 5 percent pebbles, by volume; few soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3—43 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse platy structure; very hard, firm, sticky and plastic; 5 percent pebbles, by volume; few masses of segregated lime; strongly effervescent; moderately alkaline.

Depth to carbonates ranges from 6 to 10 inches. The profile is less than 15 percent coarse fragments, by volume. Few to many masses of lime are present in the lower part of the B horizon and in the upper part of the C horizon.

Korent series

The Korent series consists of deep, well drained soils that formed in alluvium. These soils are on flood plains and on low stream terraces at an elevation of 2,600 to 4,000 feet. Slopes are 0 to 2 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 120 days.

Typical pedon of Korent loam, on hayland, 1,980 feet north and 1,980 feet east of the SW corner of sec. 17, T. 31 N., R. 18 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; granular structure; hard, friable, slightly sticky and slightly plastic; many fine continuous roots; slightly effervescent; mildly alkaline; clear wavy boundary.

C1—7 to 14 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and slightly plastic; common fine roots; common fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—14 to 60 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 5/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly effervescent; moderately alkaline.

The surface layer, to a depth of 7 to 10 inches, is grayish brown, brown, or dark grayish brown. The C horizon is silt loam, sandy clay loam, or loam. Some pedons have thin strata of loamy sand, silty clay loam, and clay loam.

Lardell series

The Lardell series consists of deep, somewhat poorly drained soils that are very strongly affected by salts and sodium. These soils formed in alluvium and are on flood plains and stream terraces in valleys at an elevation of 2,300 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 42 to 46 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Lardell silty clay loam, in native grass, 1,980 feet north and 2,310 feet east of the SW corner of sec. 3, T. 32 N., R. 20 E.

Apsa—0 to 8 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; very hard, firm, sticky and slightly plastic; common fine roots and pores; many fine salt crystals; strongly alkaline; gradual smooth boundary.

C1sa—8 to 29 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; very hard, firm, sticky and slightly plastic; few fine and very fine roots; few fine pores; strata of dark grayish brown (10YR 4/2) moist clay loam 1 to 2 inches thick; many fine salt crystals when dry; strongly effervescent; strongly alkaline; clear smooth boundary.

C2sa—29 to 60 inches; light brownish gray (10YR 6/2) loam; thin lenses of silt loam and fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, sticky and slightly plastic; salts are disseminated throughout the horizon; strongly effervescent; strongly alkaline.

Strong accumulation of salts is at a depth of 0 to 20 inches. The C horizon is loam or silty clay loam stratified with thin lenses of fine sandy loam, loam, silt loam, and silty clay loam. Lardell soils are moderately alkaline to strongly alkaline. Electrical conductivity of the C horizon ranges from 16 to 50 mmhos/cm.

Lihen series

The Lihen series consists of deep, well drained soils that formed in alluvial and eolian material. These soils are on terraces and uplands at an elevation of 2,400 to 3,000 feet. Slopes are 2 to 12 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Lihen loamy fine sand, in pasture, 2,340 feet west and 1,640 feet south of the NE corner of sec. 35, T. 33 N., R. 18 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak fine

granular structure parting to single grain; soft, very friable, nonsticky and nonplastic; few to common roots; neutral; clear wavy boundary.

A12—6 to 10 inches; dark brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure parting to single grain; soft, very friable, nonsticky and nonplastic; few to common fine roots; common fine pores; neutral; clear wavy boundary.

AC—10 to 30 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few fine and very fine roots; few fine pores; slightly effervescent in the lower part; mildly alkaline; clear wavy boundary.

Cca—30 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; 5 percent lime coated pebbles, by volume; strongly effervescent; moderately alkaline.

The A horizon is dark brown, brown, grayish brown, or dark grayish brown, and it is 10 to 30 inches thick. The C horizon is mostly loamy fine sand; some pedons have thin strata of sandy loam or loamy sand.

Lisam series

The Lisam series consists of shallow, well drained soils that formed in clayey material that weathered from clayey shale. These soils are on uplands at an elevation of 2,300 to 4,000 feet. They are underlain by platy shale at a depth of 10 to 20 inches. Slopes are 4 to 45 percent. The average annual precipitation is 12 to 15 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Lisam clay, in native grass, 1,800 feet west and 500 feet north of the SE corner of sec. 31, T. 26 N., R. 20 E.

A1—0 to 6 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; very hard, firm, very sticky and plastic; common fine and very fine roots and few medium roots; common fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—6 to 12 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and plastic; few medium, fine and very fine roots; few fine and very fine pores; about 20 percent olive gray (5Y 4/2) partially weathered shale fragments, by volume; common fine soft masses of lime and fine threads of gypsum crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—12 to 17 inches; olive gray (5Y 5/2) partially weathered shale and clay, olive gray (5Y 4/2) moist; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; few fine pores; about 20 percent light yellowish brown (2.5Y 6/4) stains; common fine threads and soft masses of gypsum; slightly effervescent; moderately alkaline; clear wavy boundary.

C3r—17 to 23 inches; olive gray (5Y 5/2) platy shale that rubs to clay, olive gray (5Y 4/2) moist; few very fine roots; pale olive (5Y 6/4) stains on some plate surfaces; few fine gypsum crystals; slightly effervescent in spots; moderately alkaline; gradual wavy boundary.

C4r—23 to 60 inches; olive (5Y 5/3) platy shale that rubs to clay and clay loam texture, olive (5Y 4/3) moist; pale olive (5Y 6/4) stains on some plates; mildly alkaline.

Depth to soft platy shale ranges from 10 to 20 inches. The A horizon, in places, has a thin vesicular crust on the surface. The A and C horizons range from grayish brown to olive.

Lolo series

The Lolo series consists of deep, well drained soils that formed in alluvium. These soils are on fans and stream terraces in mountain valleys at an elevation of 3,000 to 4,500 feet. Slopes are 0 to 4 percent. The average annual precipitation is 15 to 19 inches. The average annual temperature is 40 to 44 degrees F., and the growing season is 90 to 120 days.

Typical pedon of Lolo loam, in native grass, 2,600 feet east and 400 feet south of the NW corner of sec. 9, T. 25 N., R. 24 E.

A11—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; neutral; clear wavy boundary.

A12—6 to 22 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak moderate prismatic structure parting to moderate fine subangular blocky; hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 20 percent fine pebbles, by volume; neutral; gradual wavy boundary.

B2—22 to 38 inches; grayish brown (10YR 5/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine pores; 50 percent pebbles and 5 percent cobbles, by volume; thin lime crusts on undersides of fragments; slightly effervescent; moderately alkaline; gradual wavy boundary.

C—38 to 60 inches; grayish brown (10YR 5/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, very friable, nonsticky and nonplastic; few very fine roots; 55 percent pebbles and 5 percent cobbles, by volume; strongly effervescent; moderately alkaline.

Depth to very gravelly loam or very gravelly sandy loam ranges from 16 to 24 inches. The A horizon is dark brown or very dark grayish brown. The 10- to 40-inch control section on the average is 35 to 60 percent coarse fragments, by volume.

Macmeal series

The Macmeal series consists of deep, well drained soils that formed in colluvial and alluvial material from igneous and metamorphic rock. These soils are on mountains at an elevation of 4,000 to 6,000 feet. Slopes are 25 to 60 percent. The average annual precipitation is 17 to 25 inches. The average annual temperature is 38 to 42 degrees F., and the growing season is 80 to 100 days.

Typical pedon of Macmeal gravelly loam, in woodland, 500 feet west and 1,600 feet north of the SE corner of sec. 15, T. 26 N., R. 24 E.

O1—2 inches to 1 inch; mat of twigs, leaves, and dead plants.

O2—1 inch to 0; decomposed organic material.

A2—0 to 7 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) moist; weak fine and very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; common fine pores; many unstained sand and silt grains; about 30 percent pebbles, by volume, and few flagstones; neutral; clear wavy boundary.

B21t—7 to 14 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine granular structure; hard, friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; about 60 percent pebbles and 5 percent flagstones, by volume; neutral; clear wavy boundary.

B22t—14 to 32 inches; yellowish brown (10YR 5/4) extremely channery clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and fine blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; common very fine pores; about 70 percent rock fragments, by volume, of which 85 percent are angular pebbles and 15 percent are flagstones; neutral; gradual wavy boundary.

B23t—32 to 48 inches; yellowish brown (10YR 5/4) extremely channery clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and fine blocky structure; very hard, firm, sticky and plastic; common very fine pores; about 70 percent rock fragments, by volume, of which about 85 percent are angular pebbles and 15 percent are flagstones.

B3ca—48 to 60 inches; brown (10YR 5/3) extremely flaggy clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; very hard, friable, sticky and plastic; about 70 percent rock fragments, by volume, of which about 70 percent are angular pebbles and 30 percent are flagstones; noncalcareous matrix with lime coats on undersides of fragments; mildly alkaline.

Some pedons have a C horizon below a depth of 40 inches. Depth to accumulation of lime ranges from 25 to 55 inches. The A2 horizon is very pale brown, light brownish gray, or light gray. The B2t horizon is light yellowish brown or brown. Coarse fragments range from 50 to 75 percent, by volume, in the lower part of the B horizon and in the C horizon, where there is a C horizon.

Marmarth series

The Marmarth series consists of moderately deep, well drained soils that formed in material weathered from soft sedimentary beds. These soils are on uplands at an elevation of 2,800 to 3,800 feet. They are underlain at a depth of 20 to 40 inches by soft sedimentary beds. Slopes are 2 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Marmarth clay loam, in a cultivated field, 1,000 feet south and 1,000 feet west of the NE corner of sec. 30, T. 23 N., R. 18 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B2t—6 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, friable, sticky and plastic; common fine roots; few fine pores; few clay films on faces of peds; mildly alkaline; clear smooth boundary.

B3ca—14 to 18 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium angular and subangular blocky; hard, friable, sticky and slightly plastic; common fine roots; few fine pores; common medium soft light brownish gray (2.5Y 6/2) masses of lime; slightly effervescent; moderately alkaline; clear smooth boundary.

C1ca—18 to 24 inches; light brownish gray (2.5Y 6/2) sandy clay loam; grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; many soft masses of lime; strongly

effervescent; moderately alkaline; gradual wavy boundary.

- C2ca—24 to 30 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, very friable, slightly sticky and nonplastic; few very fine roots; few fine pores; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C3r—30 to 60 inches; light brownish gray (2.5Y 6/2) and thin strata of olive brown (2.5Y 5/4) stratified beds of soft siltstone with thin strata of soft sandstone that rub to loam, grayish brown (2.5Y 5/2) moist; slightly effervescent.

The A horizon is brown or dark brown. The B horizon is dark brown, brown, or grayish brown. There are few to many soft masses of lime in the B3ca horizon and in the Cca horizon. Sedimentary beds are soft siltstone and soft sandstone, but in some pedons they have thin strata of hard sandstone.

Martinsdale series

The Martinsdale series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and fans in uplands at an elevation of 3,200 to 4,500 feet. Slopes are 0 to 8 percent. The mean annual precipitation is 14 to 19 inches. The mean annual temperature is 41 to 45 degrees F., and the growing season is 100 to 120 days.

Typical pedon of Martinsdale clay loam, in native grass, 790 feet north and 500 feet east of the SW corner of sec. 4, T. 25 N., R. 23 E.

- A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; mildly alkaline; clear smooth boundary.
- B2t—3 to 10 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong medium and fine prismatic structure parting to moderate medium and fine angular and subangular blocky; hard, friable, sticky and plastic; many fine and very fine roots; many fine and very fine pores; thin continuous clay films on faces of peds; dark grayish brown (10YR 4/2) coats on faces of peds in the upper 4 inches; mildly alkaline; clear smooth boundary.
- B3ca—10 to 13 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; few soft masses of lime; violently effervescent; mildly alkaline; clear wavy boundary.
- C1ca—13 to 29 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; weak medium and

coarse prismatic structure; hard, friable, sticky and slightly plastic; common very fine roots in the upper part and few in the lower part; few fine pores; common large white (10YR 8/2) masses of soft lime; violently effervescent; moderately alkaline; gradual wavy boundary.

- C2ca—29 to 41 inches; light gray (10YR 7/2) clay loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; hard, friable, sticky and slightly plastic; few very fine roots; few fine pores; common medium and large white (10YR 8/2) masses of soft lime; violently effervescent; strongly alkaline; gradual wavy boundary.
- C3—41 to 54 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and slightly plastic; few to common soft masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.
- C4—54 to 60 inches; pale brown (10YR 6/3) gravelly clay loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and slightly plastic; lime coats on fragments; violently effervescent; strongly alkaline.

The A horizon is dark grayish brown, dark brown, or brown. Depth to carbonates ranges from 10 to 16 inches. The B horizon ranges from grayish brown to dark brown, and it has moderate or strong prismatic structure. The C horizon is mostly clay loam in the upper part, but ranges from clay loam to gravelly loam below a depth of 40 inches. The Cca horizon consists of 20 to 40 percent calcium carbonate equivalent.

Marvan series

The Marvan series consists of deep, well drained soils that formed in clayey alluvium. These soils are on fans and terraces in valleys and on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 15 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Marvan clay, in native grass, 200 feet south and 2,300 feet west of the NE corner of sec. 11, T. 35 N., R. 20 E.

- A11—0 to 2 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; light brownish gray (2.5Y 6/2) vesicular crust 1/4 inch thick on surface; moderate fine and very fine granular structure; slightly hard, friable, sticky and plastic; many medium and fine roots; mildly alkaline; clear smooth boundary.
- A12—2 to 7 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; many medium and fine roots; few very fine pores; vertical cracks 1/4 to 1/2 inch wide; slightly effervescent in spots; moderately alkaline; clear smooth boundary.

C1—7 to 23 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; extremely hard, very firm, very sticky and very plastic; common fine roots; few very fine pores; vertical cracks 1/4 to 1/2 inch wide; few slickensides; slightly effervescent; strongly alkaline; clear smooth boundary.

C2—23 to 32 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, firm, very sticky and plastic; few fine roots; few very fine pores; few fine seams of gypsum crystals; strongly effervescent; moderately alkaline; clear smooth boundary.

C3cs—32 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and plastic; common seams of gypsum crystals; strongly effervescent; moderately alkaline.

The A horizon is grayish brown or light brownish gray. Depth to segregated gypsum ranges from 12 to 24 inches. The C horizon has 10 to 20 percent exchangeable sodium and is moderately alkaline or strongly alkaline.

Nesda series

The Nesda series consists of deep, well drained soils that formed in alluvium. These soils are on stream terraces and flood plains at an elevation of 2,600 to 4,000 feet. They are underlain by very gravelly sand or very gravelly loamy sand at a depth of 10 to 20 inches. Slopes are 0 to 2 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 100 to 120 days.

Typical pedon of Nesda sandy loam, in native grass, 650 feet south and 1,350 feet east of the NW corner of sec. 16, T. 31 N., R. 20 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine pores; 5 percent pebbles, by volume; mildly alkaline; clear wavy boundary.

A12—7 to 11 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; common fine pores; 10 percent pebbles, by volume; slightly effervescent; mildly alkaline; clear wavy boundary.

IIC1—11 to 15 inches; grayish brown (10YR 5/2) very gravelly loamy sand, dark grayish brown (10YR 4/2)

moist; single grain; loose; common fine and very fine roots; 45 percent pebbles, by volume; lime coats on undersides of larger coarse fragments; slightly effervescent; moderately alkaline; gradual wavy boundary.

IIC2—15 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 5/3) moist; single grain; loose; few fine roots in upper part; 55 percent pebbles, by volume; slightly effervescent; moderately alkaline.

The A horizon is brown, grayish brown, or dark grayish brown loam or sandy loam. Coarse fragments in the C horizon range from 35 to 65 percent, by volume.

Nishon series

The Nishon series consists of deep, somewhat poorly drained or poorly drained soils that formed in alluvium from glacial till. These soils are in closed basins on glaciated uplands at an elevation of 2,500 to 3,300 feet. Slopes are 0 to 1 percent. The average annual precipitation is 12 to 16 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 100 to 120 days.

Typical pedon of Nishon clay loam, in native grass, 1,200 feet south and 1,400 feet east of the NW corner of sec. 16, T. 28 N., R. 22 E.

A2—0 to 5 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; many unstained silt and sand grains; neutral; abrupt smooth boundary.

B21t—5 to 8 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak coarse prismatic structure parting to strong medium subangular blocky; extremely hard, very firm, very sticky and very plastic; common fine roots; common fine and very fine pores; common thin clay films on faces of peds; moderately alkaline; clear smooth boundary.

B22tg—8 to 22 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak coarse prismatic structure parting to strong medium subangular blocky; extremely hard, very firm, very sticky and very plastic; common fine roots; common fine and very fine pores; common thin clay films on faces of peds; moderately alkaline; clear smooth boundary.

B3tcag—22 to 36 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few fine and very fine pores; thin discontinuous clay films; few fine soft masses of lime; slightly effervescent; moderately alkaline; clear smooth boundary.

Ccag—36 to 60 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; massive; extremely hard, very firm, very sticky and very plastic; common fine seams and few

soft masses of segregated lime; strongly effervescent; moderately alkaline.

The A horizon is loam or clay loam. The B horizon is gray or olive gray clay or silty clay. Depth to carbonates ranges from 20 to 36 inches. In some pedons there are yellowish brown mottles.

Nobe series

The Nobe series consists of deep, well drained and moderately well drained soils that formed in alluvium. These soils are on fans and terraces on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Nobe clay, in native range, 1,000 feet west and 1,600 feet south of the NE corner of sec. 27, T. 34 N., R. 19 E.

A2—0 to 1/2 inch; light brownish gray (2.5Y 6/2) loam, olive (5Y 4/3) moist; vesicular crust; hard, friable, sticky and slightly plastic; common fine and few medium roots; common fine pores; mildly alkaline; abrupt smooth boundary.

B2t—1/2 inch to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine subangular blocky structure; very hard, firm, sticky and very plastic; common fine and very fine roots; common fine and very fine pores; common thin clay films on peds; moderately alkaline; clear wavy boundary.

C1cs—3 to 8 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine subangular blocky structure; very hard, firm, sticky and very plastic; few fine and very fine roots; few fine and very fine pores; common fine threads of salts and gypsum; slightly effervescent in spots; moderately alkaline; clear wavy boundary.

C2sa—8 to 30 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and very plastic; very few fine and very fine roots in upper part; common very fine pores; many threads and soft masses of salts and gypsum; strongly effervescent in spots; strongly alkaline; clear wavy boundary.

C3sa—30 to 60 inches; olive (5Y 5/3) silty clay, olive (5Y 4/3) moist; massive; hard, friable, very sticky and very plastic; many threads and soft masses of salts and gypsum; strongly effervescent in spots; strongly alkaline.

The A2 horizon ranges from 1/2 inch to 2 inches in thickness and is light gray to light brownish gray. The C horizon is clay or silty clay. Some pedons are stratified with lenses of clay loam or silty clay loam. The Csa

horizon is at a depth of 8 to 16 inches, and it is 2 to 3 percent salts. The Csa horizon is moderately alkaline or strongly alkaline.

Norbert series

The Norbert series consists of shallow, well drained soils that formed in material that weathered from clayey shale. These soils are on uplands at an elevation of 2,500 to 4,400 feet. They are underlain by shale at a depth of 10 to 20 inches. Slopes are 4 to 45 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 100 to 120 days.

Typical pedon of Norbert clay, in native grass, 2,000 feet west and 10 feet north of the SE corner of sec. 25, T. 26 N., R. 23 E.

A11—0 to 1 inch; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate medium and very fine granular structure; hard, friable, very sticky and plastic; many fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

A12—1 inch to 10 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate fine granular structure; extremely hard, very firm, very sticky and very plastic; common fine roots; common very fine pores; mildly alkaline; gradual wavy boundary.

C1—10 to 14 inches; olive gray (5Y 5/2) very shaly clay, olive gray (5Y 5/2) moist; fine angular blocky structure; common very fine roots; few very fine pores; about 40 percent shale chips, by volume; mildly alkaline; gradual wavy boundary.

C2r—14 to 60 inches; olive gray (5Y 5/2) platy shale that rubs to clay and clay loam, olive gray (5Y 4/2) moist; dark gray (5Y 4/1) stains on some plate surfaces; few fine roots in upper part.

The depth to the platy shale ranges from 10 to 20 inches. The A and C horizons are grayish brown to olive gray. In some pedons there is segregated gypsum in the shale.

Perma series

The Perma series consists of deep, well drained soils that formed in colluvium and alluvium from igneous and hard sandstone. These soils are on the sides of hills and mountains at an elevation of 3,500 to 6,500 feet. Slopes are 25 to 60 percent. The average annual precipitation is 15 to 20 inches. The average annual temperature is 40 to 44 degrees F. The growing season is 90 to 110 days.

Typical pedon of Perma gravelly loam, in native grass, 2,560 feet south and 270 feet east of the NW corner of sec. 35, T. 29 N., R. 20 E.

A11—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly loam, very dark brown (10YR 2/2) moist;

moderate medium granular structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; many fine and few medium roots; 20 percent subrounded pebbles and 5 percent angular cobbles, by volume; neutral; clear wavy boundary.

- A12—5 to 11 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common to many fine and very fine roots and few medium roots; many fine and medium pores; about 50 percent angular pebbles and 10 percent angular cobbles, by volume; mildly alkaline; clear wavy boundary.
- B2—11 to 40 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, friable, sticky and slightly plastic; common fine and very fine roots in upper part grading to very few in the lower part; common fine and very fine pores; 50 percent angular pebbles and 10 percent angular cobbles, by volume; mildly alkaline; gradual wavy boundary.
- C—40 to 60 inches; grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 50 percent angular pebbles and 20 percent angular cobbles, by volume; lime coats on underside of larger coarse fragments; mildly alkaline.

The A horizon is very dark grayish brown or dark brown. It is 7 to 14 inches thick. Coarse fragments are mostly angular igneous rocks, but in some places they are hard sandstone. In some pedons, the soil material at a depth of 40 to 60 inches is calcareous.

Phillips series

The Phillips series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Phillips loam, in native grass, 1,850 feet north and 300 feet east of the SW corner of sec. 3, T. 35 N., R. 19 E.

- A1—0 to 2 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak thin and very thin platy structure parting to moderate very fine granular; soft, very friable, nonsticky and nonplastic; upper surface of plates is light gray (10YR 7/2) dry; many fine and very fine roots; many fine pores; slightly acid; clear smooth boundary.
- A21—2 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak thin platy; soft, very friable, slightly

sticky and nonplastic; upper surface of plates has skeletons of light gray (10YR 7/2) unstained grains of sand and silt; many fine roots; many fine pores; slightly acid; clear wavy boundary.

- A22—4 to 7 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate thin and very thin platy; hard, very friable, slightly sticky and slightly plastic; upper surface of plates has skeletons of light gray (10YR 7/2) unstained grains of sand; many fine roots; many fine pores; slightly acid; abrupt wavy boundary.
- B21t—7 to 10 inches; brown (10YR 5/3) light clay, dark brown (10YR 4/3) moist; strong fine and medium prismatic structure parting to strong fine and very fine subangular blocky; very hard, friable, sticky and plastic; continuous dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; light gray (10YR 7/2) skeletons on vertical surface of peds; many fine roots; many fine and very fine pores; neutral; clear wavy boundary.
- B22t—10 to 15 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; strong fine and medium prismatic structure parting to strong fine and very fine blocky; very hard, friable, sticky and plastic; continuous dark grayish brown (10YR 4/2) clay films on faces of peds and lining some pores; common unstained sand grains on faces of prisms; many fine roots mainly along ped faces; many fine inped pores; moderately alkaline; clear wavy boundary.
- B3ca—15 to 22 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong medium and coarse blocky; extremely hard, firm, sticky and plastic; thin patchy clay films on faces of peds; common fine roots; many fine pores; slightly effervescent; few masses of segregated lime; moderately alkaline; clear wavy boundary.
- C1ca—22 to 36 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse and very coarse prismatic structure parting to moderate medium and coarse blocky; very hard, firm, sticky and plastic; common to few fine roots; many fine pores; 5 percent pebbles, by volume, and few lignite and shale fragments; strongly effervescent with common soft masses of segregated lime; moderately alkaline; gradual wavy boundary.
- C2cs—36 to 78 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak very coarse prismatic structure in upper part parting to weak very thick platy; weak very thick platy structure in the lower part; very hard, firm, sticky and plastic; few fine roots; common fine pores; 5 percent cobbles and pebbles, by volume, and few to many lignite chips; slightly effervescent; mildly to moderately alkaline; common nests of gypsum.

The depth to carbonates ranges from 12 to 18 inches. The B horizon is brown, grayish brown, or dark grayish brown clay loam or clay.

Reeder series

The Reeder series consists of moderately deep, well drained soils that formed in material that weathered from siltstone and shale. These soils are on uplands at an elevation of 2,400 to 3,600 feet. Slopes are 2 to 8 percent. The average annual precipitation is 13 to 16 inches, and the average annual temperature is 41 to 45 degrees F. The growing season is 100 to 125 days.

Typical pedon of Reeder loam, in cultivated field, 350 feet south and 300 feet east of the NW corner of sec. 32, T. 32 N., R. 20 E.

- Ap—0 to 7 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, slightly firm, slightly sticky and slightly plastic; many fine roots; many fine pores; neutral; clear smooth boundary.
- B2t—7 to 16 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and plastic; many fine roots; many fine and very fine pores; few thin clay films on faces of peds; mildly alkaline; clear smooth boundary.
- B3ca—16 to 20 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, slightly sticky and plastic; common fine and very fine roots; many fine and very fine pores; violently effervescent; moderately alkaline; clear wavy boundary.
- C1ca—20 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine pores; violently effervescent; moderately alkaline; clear smooth boundary.
- IIc2r—28 to 45 inches; light olive gray (5Y 6/2) soft siltstone that rubs to loam or silt loam; slightly effervescent.
- IIc3r—45 to 60 inches; light brownish gray (2.5Y 6/2) soft sandstone that rubs to fine sandy loam or loamy fine sand, grayish brown (2.5Y 5/2) moist.

The A horizon is dark brown or dark grayish brown. The depth to soft sandstone or soft siltstone ranges from 20 to 40 inches.

Riedel series

The Riedel series consists of moderately deep, well drained soils that formed in material that weathered from soft sandstone. These soils are on uplands at an

elevation of 2,800 to 4,000 feet. Slopes are 4 to 20 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Riedel fine sandy loam, in native grass, 2,540 feet south and 1,840 feet west of the NE corner of sec. 34, T. 26 N., R. 20 E.

- A1—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium and fine granular structure; soft, very friable, nonsticky and nonplastic; many medium and fine roots; slightly effervescent; mildly alkaline; gradual wavy boundary.
- C1—5 to 17 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure; soft, very friable, nonsticky and nonplastic; common medium and fine roots; common fine pores; few soft masses of segregated lime; strongly effervescent; moderately alkaline; clear wavy boundary.
- C2—17 to 24 inches; light yellowish brown (10YR 6/4) soft calcareous weathered sandstone that crushes to loamy very fine sand and fine sandy loam; common fine roots; strongly effervescent; moderately alkaline.
- C3r—24 to 60 inches; light yellowish brown (10YR 6/4) soft sandstone; thin horizontal bedding planes; few roots in cracks in upper part.

The A horizon is 2 to 6 inches thick and is light brownish gray or grayish brown. The C horizon is grayish brown to very pale brown. The depth to strongly weathered sandstone is 10 to 20 inches, and the depth to soft sandstone is 20 to 40 inches. In some pedons there are thin hard layers of sandstone in the C horizon.

Savage series

The Savage series consists of deep, well drained soils that formed in alluvium. These soils are on stream terraces and fans on uplands at an elevation of 2,500 to 4,000 feet. Slopes are 0 to 4 percent. The average annual precipitation is 14 to 19 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 120 days.

Typical pedon of Savage silty clay loam, in cultivated field, 2,240 feet east and 600 feet south of the NW corner of sec. 10, T. 29 N., R. 20 E.

- Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; very hard, friable, sticky and plastic; many fine roots; neutral; clear wavy boundary.
- B2t—6 to 14 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to

strong medium angular blocky; very hard, firm, sticky and plastic; many fine and very fine roots; common fine and very fine pores; moderately thick clay films on faces of peds; mildly alkaline; clear wavy boundary.

B3ca—14 to 21 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium angular and subangular blocky; very hard, friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; thin discontinuous clay films; few fine threads of soft lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1ca—21 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, sticky and plastic; common fine and very fine roots; common fine and very fine pores; few fine threads of soft lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2cs—36 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and plastic; few fine and very fine roots; few fine pores; few fine yellowish brown (10YR 5/6) mottles; few fine threads of gypsum; slightly effervescent; moderately alkaline; gradual wavy boundary.

C3—48 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few yellowish brown (10YR 5/6) mottles; moderately alkaline.

Depth to carbonates ranges from 10 to 20 inches. The B horizon is silty clay loam or silty clay and contains 35 to 45 percent clay. The Cca horizon has few to many soft masses or threads of lime.

Scobey series

The Scobey series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,400 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Scobey clay loam, in cultivated field, 500 feet west and 100 feet north of the SE corner of sec. 5, T. 34 N., R. 24 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; hard, friable, sticky and plastic; many fine roots; 5 percent pebbles, by volume; neutral; clear wavy boundary.

B2t—6 to 12 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong fine and medium prismatic structure parting to strong fine angular blocky; hard,

friable, sticky and plastic; many fine roots; many fine and very fine tubular pores; dark grayish brown (10YR 4/2) thin continuous clay films on faces of peds; 5 percent pebbles, by volume; neutral; clear wavy boundary.

B3tca—12 to 19 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong fine subangular blocky; very hard, friable, sticky and plastic; common fine roots; many fine and very fine tubular pores; thin continuous clay films on vertical faces of peds; 5 percent pebbles, by volume; few soft masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

C1ca—19 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse and very coarse prismatic structure parting to weak subangular blocky; very hard, firm, sticky and plastic; few fine and very fine roots; common fine and very fine pores; 5 percent pebbles, by volume; many soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C2cs—42 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; very hard, firm, sticky and plastic; 5 percent pebbles, by volume; common soft masses of gypsum and lime; strongly effervescent; moderately alkaline.

The combined thickness of the A and B horizons is from 12 to 24 inches. The B horizon is clay loam or light clay and has moderate or strong grades of prismatic and blocky structure. It is brown, dark brown, or dark grayish brown. Gravel in the pedon ranges from less than 5 percent throughout to as much as 15 percent in some horizons. Common or many soft masses of lime are present in the B3tca and C1ca horizons. Some C horizons lack the gypsum crystals.

Shaak series

The Shaak series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and fans on uplands at an elevation of 3,000 to 4,200 feet. Slopes are 0 to 4 percent. The average annual precipitation is 13 to 17 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Shaak loam, in native grass, 100 feet east and 1,590 feet north of the SW corner of sec. 8, T. 25 N., R. 18 E.

A11—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; many fine roots; many unstained sand and silt grains on plates; neutral; clear wavy boundary.

- A12—2 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak thin and medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; common fine pores; many unstained sand and silt grains on plates; neutral; abrupt wavy boundary.
- B1—4 to 6 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; strong fine subangular blocky structure; hard, friable, sticky and plastic; common fine roots; common fine pores; thin frosting of unstained sand and silt grains on faces of peds; 5 percent fine pebbles, by volume; mildly alkaline; clear wavy boundary.
- B21t—6 to 10 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong fine and medium prismatic structure parting to strong fine angular blocky; extremely hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine pores; dark brown (10YR 4/3) stains on thin continuous clay films; few unstained sand and silt grains on vertical faces of peds; 5 percent pebbles, by volume; mildly alkaline; clear wavy boundary.
- B22t—10 to 16 inches; brown (10YR 5/3) clay, dark grayish brown (10YR 4/2) moist; strong fine angular blocky; friable, sticky and plastic; few fine roots; common fine and very fine pores; dark grayish brown (10YR 4/2) stains on thin continuous clay films; 5 percent pebbles, by volume; mildly alkaline; clear wavy boundary.
- B23tca—16 to 20 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium prismatic structure parting to strong fine angular and subangular blocky; extremely hard, firm, sticky and plastic; few fine roots; common fine and very fine pores; dark grayish brown (2.5Y 4/2) stains on thin discontinuous clay films; 5 percent pebbles, by volume; few soft masses of lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.
- B3ca—20 to 28 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, friable, sticky and plastic; few very fine roots; common fine and very fine pores; 5 percent pebbles, by volume; common to many soft masses of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.
- IIc1ca—28 to 42 inches; brown (10YR 5/3) gravelly sandy clay loam, dark brown (10YR 4/3) moist; massive; hard, very friable, slightly sticky and slightly plastic; few fine and very fine pores; 20 percent pebbles, by volume; common seams and coarse soft masses of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.
- IIc2—42 to 60 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; single

grain; soft, very friable, nonsticky and nonplastic; 35 percent pebbles, by volume; few coarse seams of soft lime; strongly effervescent; moderately alkaline.

The C horizon below a depth of 40 inches is very gravelly loam or very gravelly sandy loam.

Shawmut series

The Shawmut series consists of deep, well drained soils that formed in alluvium on terraces and fans on uplands at an elevation of 2,800 to 4,000 feet. Slopes are 0 to 8 percent. The annual precipitation is 14 to 19 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 100 to 120 days.

Typical pedon of Shawmut gravelly loam, in native grass, 1,300 feet north and 1,000 feet east of the SW corner of sec. 15, T. 28 N., R. 21 E.

- A1—0 to 3 inches; dark brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; 15 percent pebbles, by volume, and few cobbles on the surface and in the horizon; neutral; clear wavy boundary.
- B21t—3 to 9 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; weak fine prismatic structure parting to strong fine angular and subangular blocky; hard, friable, sticky and plastic; many fine roots; common fine pores; common thin clay films on faces of peds and on pebbles; 25 percent pebbles and 5 percent cobbles, by volume; neutral; clear wavy boundary.
- B22t—9 to 12 inches; dark grayish brown (10YR 4/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; strong fine angular and subangular blocky structure; hard, friable, sticky and plastic; many fine and very fine roots; common fine pores; common thin continuous clay films on faces of peds and on pebbles; 35 percent pebbles and 5 percent cobbles, by volume; mildly alkaline; clear wavy boundary.
- B23tca—12 to 15 inches; grayish brown (10YR 5/2) very gravelly clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine angular and subangular blocky structure; hard, very friable, sticky and plastic; common fine roots; common fine pores; few thin patchy clay films on faces of peds; 50 percent pebbles and 5 percent cobbles, by volume; strongly effervescent; moderately alkaline; clear irregular boundary.
- IIc1ca—15 to 24 inches; grayish brown (2.5Y 5/2) very gravelly loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; 50 percent pebbles and 5 percent cobbles, by volume; lime coats on undersides of coarse fragments;

violently effervescent; moderately alkaline; gradual boundary.

II C2ca—24 to 60 inches; grayish brown (2.5Y 5/2) extremely gravelly loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots in upper part; few fine pores; 60 percent pebbles and 10 percent cobbles, by volume; lime coats on undersides of pebbles; violently effervescent; moderately alkaline.

The B horizon is brown, grayish brown, or dark grayish brown. Coarse fragments, to a depth of 24 to 36 inches, range from 35 to 60 percent, by volume, and are mainly pebbles. Below 36 inches the coarse fragments range from 50 to 70 percent, by volume, and are mainly pebbles; less than 15 percent are cobbles.

Silverchief series

The Silverchief series consists of deep, well drained soils that formed in colluvial and alluvial material weathered from mixed sedimentary and igneous rocks. These soils are on mountain slopes and fans at an elevation of 4,000 to 6,000 feet. Slopes are 8 to 35 percent. The average annual precipitation is 17 to 22 inches. The average annual temperature is 38 to 42 degrees F. The growing season is 80 to 100 days.

Typical pedon of Silverchief loam, in woodland, 1,500 feet west and 2,060 feet south of the NE corner of sec. 9, T. 25 N., R. 24 E.

O1—3 inches to 2; organic mat of needles, leaves, and twigs.

O2—2 inches to 0; humus layer.

A2—0 to 5 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine and very fine pores; many unstained silt and sand grains; 5 percent pebbles, by volume; neutral; clear wavy boundary.

B21t—5 to 20 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, firm, sticky and plastic; many fine and medium roots; many fine pores; common medium olive brown (2.5Y 4/4) clay films on faces of peds; 10 percent pebbles, by volume; neutral; clear wavy boundary.

B22t—20 to 27 inches; light olive brown (2.5Y 5/4) gravelly clay, olive brown (2.5Y 4/4) moist; moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots; many fine pores; thin patchy clay films on faces of peds; 20 percent pebbles and 10 percent cobbles, by volume; thin coats of lime on undersides of smaller coarse fragments and as

crusts on undersides of larger coarse fragments; matrix is noncalcareous but is slightly effervescent around coarse fragments; mildly alkaline; gradual wavy boundary.

Cca—27 to 60 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots in upper part grading to few fine and medium roots in lower part; common fine pores; 35 percent pebbles and 15 percent cobbles, by volume; lime coats on coarse fragments; strongly effervescent; moderately alkaline.

The A horizon is 3 to 6 inches thick. The A2 horizon is very pale brown, pale brown, or light brownish gray. The B2 horizons are brown or light olive brown. Coarse fragments range from 5 percent, by volume, in the upper part of the B2t horizon to 30 percent in the lower part. A B3ca horizon is present in some pedons. Depth to strong accumulation of lime ranges from 17 to 30 inches. The C horizon is light yellowish brown, pale brown, or brown.

Straw series

The Straw series consists of deep, well drained soils that formed in alluvium. These soils are on flood plains and stream terraces at an elevation of 2,600 to 4,000 feet. Slopes are 0 to 2 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 120 days.

Typical pedon of Straw loam, in native grass, 10 feet north and 1,200 feet east of the SW corner of sec. 17, T. 13 N., R. 18 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; many fine roots; many fine and very fine pores; mildly alkaline; clear wavy boundary.

A12—7 to 21 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; many fine roots; many fine and very fine pores; few thin lenses of fine sandy loam; slightly effervescent; mildly alkaline; clear smooth boundary.

C—21 to 60 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; few fine olive brown (2.5Y 4/4) mottles; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; common fine pores; thin lenses of sandy loam and silty clay loam; strongly effervescent; moderately alkaline; clear wavy boundary.

The surface layer ranges from calcareous to noncalcareous. The mollic epipedon is 20 to 32 inches

thick. In some places there is a buried A horizon. The horizons below a depth of 30 to 40 inches are stratified with thin lenses of loam, fine sandy loam, clay loam, or silt loam.

Telstad series

The Telstad series consists of deep, well drained soils that formed in glacial till. These soils are on glaciated uplands at an elevation of 2,400 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Telstad loam, in cultivated field, 600 feet south and 75 feet east of the NW corner of sec. 27, T. 37 N., R. 23 E.

- Ap—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine pores; neutral; clear wavy boundary.
- B21t—7 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine prismatic structure parting to moderate medium and fine angular blocky; hard, friable, sticky and plastic; many fine roots; common fine pores; thin very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; mildly alkaline; clear smooth boundary.
- B22t—10 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate medium angular blocky; hard, friable, sticky and plastic; common fine roots; few to common fine and very fine pores; thin dark grayish brown (10YR 3/2) clay films on vertical faces of peds; mildly alkaline; clear wavy boundary.
- B3tca—14 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium angular and subangular blocky; hard, friable, sticky and plastic; common fine roots; common fine pores; thin discontinuous clay films on vertical faces of peds; few to common soft masses of lime; slightly to strongly effervescent; mildly alkaline; gradual wavy boundary.
- C1ca—18 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; few fine roots; common fine and medium pores; 5 percent pebbles, by volume; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C2—32 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; hard, friable, sticky and plastic;

few very fine roots in upper part; common pores; 5 percent pebbles, by volume; few soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

- C3—45 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; 5 percent pebbles, by volume; strongly effervescent; moderately alkaline.

The thickness of the A horizon ranges from 4 to 8 inches. The A horizon is loam or gravelly loam. The B horizon is brown or grayish brown. In some areas, strata of sandy clay loam are present in the C horizon. Coarse fragments range from 0 to 10 percent in the B and C horizons and from 0 to 25 percent in the surface layer.

Thoeny series

The Thoeny series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,400 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 15 inches. The average annual temperature is 41 to 45 degrees F. The growing season is 105 to 125 days.

Typical pedon of Thoeny loam, in native grass, 1,000 feet east and 500 feet south of the NW corner of sec. 29, T. 34 N., R. 20 E.

- A21—0 to 3 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine roots; common fine pores; many unstained silt and sand grains; neutral; clear wavy boundary.
- A22—3 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; common fine pores; many unstained silt and sand grains; mildly alkaline; abrupt wavy boundary.
- B21t—6 to 9 inches; brown (10YR 5/3) clay, grayish brown (10YR 4/1) moist; strong fine and medium columnar structure parting to weak medium angular blocky; extremely hard, firm, sticky and very plastic; common fine and very fine roots between peds; few very fine and fine pores; moderately thick dark grayish brown (10YR 4/2) clay films on faces of peds; light gray (10YR 6/1) skeletons on top of columns and common unstained silt and sand grains on vertical faces of peds; mildly alkaline; clear wavy boundary.
- B22t—9 to 12 inches; brown (10YR 5/3) clay, dark grayish brown (10YR 4/2) moist; strong medium and fine prismatic structure parting to moderate medium and fine angular blocky; very hard, firm, sticky and very plastic; common fine and very fine roots; few

very fine pores; dark grayish brown (10YR 4/2) coats on faces of peds; thin continuous clay films on faces of peds; moderately alkaline; clear wavy boundary.

B31tca—12 to 17 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate medium angular and subangular blocky; very hard, firm, sticky and very plastic; common very fine roots; few fine and very fine pores; thin discontinuous clay films; 5 percent lime-coated fine pebbles, by volume; strongly effervescent; strongly alkaline; clear wavy boundary.

B32cacs—17 to 28 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular and angular blocky; very hard, firm, sticky and very plastic; few very fine roots; common fine and very fine pores; 5 percent lime-coated pebbles, by volume; common fine soft masses and threads of lime and gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

C1cacs—28 to 52 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky structure in the upper part grading to weak coarse subangular blocky structure in the lower part; very hard, friable, sticky and plastic; few very fine roots in the upper part; common fine pores; 5 percent lime-coated pebbles, by volume; common medium and fine soft masses and threads of lime and gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2cs—52 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; very hard, friable, sticky and plastic; common fine soft threads of gypsum; slightly effervescent; moderately alkaline.

Depth to carbonates ranges from 12 to 18 inches. The A horizon is 5 to 8 inches thick. It is medium acid to neutral. The B2t horizon is brown, dark brown, or grayish brown clay loam or clay. It has moderate or strong columnar structure in the upper 2 to 4 inches and moderate or strong prismatic and blocky structure below that. It is mildly alkaline to strongly alkaline. The Ccs horizon has 15 to 25 percent exchangeable sodium. It is mildly alkaline to strongly alkaline.

Turner series

The Turner series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and fans on uplands at an elevation of 2,800 to 4,200 feet. They are underlain by very gravelly loamy sand or very gravelly sand at a depth of 20 to 40 inches. Slopes are 0

to 8 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 120 days.

Typical pedon of Turner loam, in native grass, 1,540 feet west and 2,470 feet north of the SE corner of sec. 21, T. 27 N., R. 19 E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; 10 percent pebbles, by volume; neutral; abrupt wavy boundary.

B21t—2 to 4 inches; dark grayish brown (10YR 4/2) clay loam, dark brown (10YR 3/3) moist; strong very fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; continuous clay films on faces of peds; 10 percent pebbles, by volume, with few cobbles; neutral; clear wavy boundary.

B22t—4 to 7 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine and fine roots; common very fine pores; continuous clay films on faces of peds, in pores, and on surface of pebbles; 10 percent pebbles, by volume, with few cobbles; neutral; clear wavy boundary.

B23t—7 to 11 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, friable, sticky and plastic; common very fine roots; few very fine pores; continuous thin clay films on faces of peds, in pores, and on surface of pebbles; 10 percent pebbles, by volume, with few cobbles; mildly alkaline; abrupt wavy boundary.

C1ca—11 to 16 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; weak medium and coarse angular blocky structure; very hard, very friable, sticky and slightly plastic; common fine roots; few fine pores; 10 percent pebbles, by volume, with few cobbles; many coarse masses of lime; violently effervescent; moderately alkaline; diffuse wavy boundary.

C2ca—16 to 26 inches; light gray (10 YR 7/2) gravelly loam, brown (10YR 5/3) moist; massive; very hard, very friable, sticky and slightly plastic; few very fine roots; common very fine pores; 15 percent pebbles and 5 percent cobbles, by volume; calcium carbonate coatings on underside of coarse fragments; many coarse masses of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.

II C3ca—26 to 60 inches; grayish brown (2.5Y 5/2) very gravelly loamy coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; 40 percent

pebbles and 15 percent cobbles, by volume; calcium carbonate coatings on underside of coarse fragments; strongly effervescent; moderately alkaline.

The A horizon is dark grayish brown, very dark grayish brown, or dark brown. The B horizon is brown, dark brown, or grayish brown loam, clay loam, or sandy clay loam. The lower part of the C horizon is very gravelly sand or very gravelly loamy sand.

Twilight series

The Twilight series consists of moderately deep, well drained soils that formed in material weathered from soft sandstone. These soils are on uplands at an elevation of 2,800 to 4,000 feet. They are underlain by soft sandstone at a depth of 20 to 40 inches. Slopes are 4 to 20 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Twilight fine sandy loam, in native grass, 1,050 feet north and 1,880 feet east of the SW corner of sec. 18, T. 27 N., R. 21 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.

B2—3 to 11 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate and fine subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; many fine and very fine roots; common medium and fine pores; mildly alkaline; gradual wavy boundary.

C1ca—11 to 22 inches; pale olive (5Y 6/3) fine sandy loam, olive (5Y 5/4) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; few fine pores; moderately alkaline; violently effervescent; gradual wavy boundary.

C2ca—22 to 35 inches; pale olive (5Y 6/3) fine sandy loam, olive (5Y 5/4) moist; massive; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine pores; few soft sandstone fragments; violently effervescent; moderately alkaline; clear wavy boundary.

C3r—35 to 60 inches; soft calcarious sandstone that crushes to fine sandy loam and loamy fine sand.

Depth to soft or slightly indurated sandstone ranges from 20 to 40 inches. The A horizon is grayish brown or brown.

Vanda series

The Vanda series consists of deep, well drained soils that formed in clayey alluvium. These soils are on fans and terraces in valleys and on fans on uplands at an elevation of 2,300 to 3,300 feet. Slopes are 0 to 8 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Vanda clay, in native grass, 1,100 feet east and 1,000 feet south of the NW corner of sec. 9, T. 23 N., R. 18 E.

A1—0 to 6 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium granular structure; very hard, firm, very sticky and very plastic; common fine roots; few fine pores; thin light brownish gray (2.5Y 6/2) vesicular crust that is 1/4 to 1/2 inch thick on the surface; slightly effervescent; strongly alkaline; clear smooth boundary.

C1cs—6 to 16 inches; olive gray (5Y 5/2) clay, olive gray (5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; common to few fine roots; few fine pores; common fine soft threads of gypsum; strongly effervescent; very strongly alkaline; gradual wavy boundary.

C2cs—16 to 26 inches; olive gray (5Y 5/2) clay, olive gray (5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; few fine roots; few fine pores; few fine soft threads of gypsum; strongly effervescent; very strongly alkaline; gradual wavy boundary.

C3—26 to 60 inches; olive gray (5Y 5/2) clay, olive gray (5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; strongly effervescent; very strongly alkaline.

The depth to segregated gypsum ranges from 11 to 20 inches. The C horizon is light olive gray to grayish brown clay or silty clay. In some places, there are thin strata of silty clay loam, clay loam, and sandy clay loam below a depth of 30 inches. The C horizon has 15 to 30 percent exchangeable sodium. It is strongly alkaline or very strongly alkaline.

Vida series

The Vida series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,400 to 3,800 feet. Slopes are 2 to 25 percent. The average annual precipitation is 13 to 17 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Vida clay loam, in native grass, 400 feet east and 1,400 feet south of the NW corner of sec. 25, T. 29 N., R. 21 E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

B1—2 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and slightly plastic; many fine roots; common fine and very fine pores; mildly alkaline; clear smooth boundary.

B2t—4 to 9 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong medium and fine angular and subangular blocky; very hard, friable, sticky and plastic; many fine roots; few fine and very fine pores; thin continuous clay films; mildly alkaline; clear wavy boundary.

B3ca—9 to 14 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; common fine roots; common fine and very fine pores; few to common soft masses of lime; strongly effervescent in the upper part and violently effervescent in the lower part; mildly alkaline; clear wavy boundary.

C1ca—14 to 34 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure; very hard, friable, sticky and plastic; few to common fine roots; common fine and very fine pores; common to many soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—34 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few fine roots in upper part; common fine pores; few soft masses of lime; strongly effervescent; moderately alkaline.

The mollic epipedon is 7 to 9 inches thick. Depth to carbonates ranges from 6 to 10 inches. The surface layer is loam or clay loam. The C horizon is clay loam or loam.

Wabek series

The Wabek series consists of deep, excessively drained soils that formed in alluvium. These soils are on outwash terraces on uplands at an elevation of 2,400 to 3,600 feet. They are underlain by very gravelly sand or very gravelly loamy coarse sand at a depth of 6 to 14 inches. Slopes are 2 to 35 percent. The average annual precipitation is 12 to 17 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 100 to 125 days.

Typical pedon of Wabek gravelly loam, in native grass, 1,050 feet north and 1,320 feet east of the SW corner of sec. 23, T. 25 N., R. 18 E.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and slightly plastic; many fine roots; 15 percent pebbles, by volume; mildly alkaline; clear smooth boundary.

A12—3 to 8 inches; dark brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine and very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; common fine pores; 20 percent pebbles, by volume; lime coats on undersides of pebbles; mildly alkaline; clear wavy boundary.

IIIC1ca—8 to 15 inches; light brownish gray (2.5Y 6/2) very gravelly loamy coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; common fine roots; 35 percent pebbles, by volume; lime coats on pebbles and masses of lime; violently effervescent; moderately alkaline; gradual boundary.

IIIC2—15 to 60 inches; grayish brown (2.5Y 5/2) very gravelly coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; few fine roots in upper part; 55 percent pebbles, by volume; lime crusts on undersides of larger pebbles in upper part; slightly effervescent; moderately alkaline.

The A horizon is brown, grayish brown, or dark grayish brown. The underlying material ranges from very gravelly loamy coarse sand to very gravelly sand. Depth to carbonates ranges from 6 to 9 inches.

Warneke series

The Warneke series consists of shallow, well drained soils that formed in material that weathered from hard limestone. These soils are on mountains at an elevation of 4,000 to 6,000 feet. They are underlain by hard limestone at a depth of 10 to 20 inches. Slopes are 25 to 70 percent. The average annual precipitation is 17 to 25 inches. The average annual temperature is 38 to 42 degrees F., and the growing season is 80 to 100 days.

Typical pedon of Warneke gravelly loam, in native grass, 400 feet south and 2,640 feet east of the NW corner of sec. 20, T. 26 N., R. 24 E.

A1—0 to 4 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; 20 percent subrounded pebbles, by volume, and few angular cobbles; strongly effervescent; moderately alkaline; clear smooth boundary.

B2—4 to 15 inches; very pale brown (10YR 7/3) very channery loam, pale brown (10YR 6/3) moist;

moderate fine subangular blocky structure; hard, friable, sticky and slightly plastic; few fine and medium roots; common fine and very fine pores; 25 percent angular pebbles and 15 percent angular cobbles, by volume; lime crusts on undersides of fragments; violently effervescent; moderately alkaline; clear wavy boundary.

R—15 inches; limestone bedrock.

The A horizon is grayish brown, brown, or dark brown. Coarse fragments make up 35 to 50 percent of the B horizon; the calcium carbonate equivalent makes up 40 to 60 percent. The limestone bedrock is fractured in some pedons.

Whitecow series

The Whitecow series consists of deep, well drained soils that formed in alluvium and colluvium from limestone. These soils are on mountainsides at an elevation of 4,000 to 6,000 feet. Slopes are 25 to 60 percent. The average annual precipitation is 17 to 25 inches. The average annual temperature is 40 to 45 degrees F. The growing season is 80 to 100 days.

Typical pedon of Whitecow gravelly loam, in woodland, 500 feet west and 1,500 feet south of the NE corner of sec. 26, T. 20 N., R. 24 E.

O1—1 inch to 0; forest litter of needles and twigs.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine roots and few medium roots; 25 percent subrounded pebbles, by volume; slightly effervescent; moderately alkaline; clear smooth boundary.

A12—3 to 10 inches; grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine roots; common fine pores; 40 percent angular pebbles, by volume, and few angular cobbles; lime crusts on undersides of pebbles and cobbles; violently effervescent; moderately alkaline; clear boundary.

B2—10 to 20 inches; light brownish gray (2.5Y 6/2) very gravelly loam, light olive brown (2.5Y 5/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few or common fine roots; common fine pores; 60 percent angular pebbles, by volume, and few angular cobbles; lime coats on coarse fragments; violently effervescent; moderately alkaline; gradual boundary.

C1ca—20 to 30 inches; light brownish gray (2.5Y 6/2) extremely gravelly loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly

plastic; few fine roots; few fine pores; about 70 percent angular pebbles, by volume, and few angular cobbles; lime coats on coarse fragments; violently effervescent; moderately alkaline; gradual boundary.

C2ca—30 to 60 inches; light brownish gray (2.5Y 6/2) extremely gravelly loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, sticky and slightly plastic; few fine roots; few fine pores; 70 percent angular pebbles, by volume, and few angular cobbles; violently effervescent; moderately alkaline.

The A horizon is brown, grayish brown, or dark grayish brown. Under dense forest cover there is a thin A2 horizon. The upper part of the 10- to 14-inch control section is 35 to 60 percent coarse fragments, by volume. The lower part is 60 to 80 percent coarse fragments, by volume, mostly pebbles. The Cca horizon is 40 to 60 percent calcium carbonate equivalent.

Williams series

The Williams series consists of deep, well drained soils that formed in glacial till. They are on uplands at an elevation of 2,400 to 3,600 feet. Slopes are 0 to 8 percent. The average annual precipitation is 13 to 17 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 100 to 125 days.

Typical pedon of Williams loam, in cultivated field, 1,900 feet east and 10 feet south of the NW corner of sec. 35, T. 32 N., R. 18 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; soft, very friable, slightly sticky and slightly plastic; many fine roots; common fine and very fine pores; few clear unstained sand grains; neutral; clear smooth boundary.

B2t—6 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate fine subangular and angular blocky; very hard, friable, sticky and plastic; many fine roots; common fine and very fine pores; thin continuous clay films on faces of peds; peds are coated with a few clear unstained sand grains and common stained sand grains; mildly alkaline; clear irregular boundary.

B3tca—14 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and slightly plastic; common fine and very fine roots; many fine and very fine pores; thin clay films on vertical faces of peds; 5 percent pebbles, by volume; few fragments of lignite; common large soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C1ca—20 to 41 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate coarse and medium subangular blocky; extremely hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine pores; 5 percent pebbles, by volume; few fragments of shale and lignite; common white masses and films of segregated lime and hard lime casts on pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—41 to 53 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak very coarse prismatic structure parting to moderate thick platy; extremely hard, friable, slightly sticky and slightly plastic; few fine and very fine pores; few fragments of shale and lignite; 5 percent pebbles, by volume; few soft masses of gypsum crystals in lower part; strongly effervescent; moderately alkaline; gradual boundary.

C3ca—53 to 60 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; strong thick and very thick platy structure; extremely hard, friable, slightly sticky and slightly plastic; 5 percent pebbles, by volume; segregated gypsum as clear crystals in horizontal seams between plates and along vertical breaks in plates; slightly effervescent; moderately alkaline.

The mollic epipedon is 7 to 12 inches thick. Depth to carbonates ranges from 10 to 16 inches. The B horizon has moderate or strong grades of prismatic structure. The Cca horizon has few to many soft masses of lime. The pedon is less than 15 percent coarse fragments, by volume.

Windham series

The Windham series consists of deep, well drained soils that formed in alluvium derived mostly from limestone. These soils are on terraces and fans on uplands at an elevation of 3,200 to 4,500 feet. Slopes are 4 to 45 percent. The average annual precipitation is 14 to 18 inches. The average annual temperature is 40 to 44 degrees F., and the growing season is 90 to 120 days.

Typical pedon of Windham gravelly loam, in native grass, 2,260 feet west and 200 feet south of the NE corner of sec. 1, T. 25 N., R. 23 E.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and nonplastic; many fine roots; 20 percent fine pebbles, by volume; strongly effervescent; mildly alkaline; clear wavy boundary.

C1ca—6 to 20 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; massive;

slightly hard, friable, sticky and plastic; common fine roots; common fine pores; 35 percent pebbles and 5 percent cobbles, by volume; lime coats on pebbles; violently effervescent; moderately alkaline; clear wavy boundary.

C2—20 to 60 inches; pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; soft, friable, slightly sticky and nonplastic; few fine and very fine roots in upper part; common fine pores; 45 percent cobbles, by volume; lime coats on undersides of coarse fragments; violently effervescent; moderately alkaline.

The A horizon is grayish brown or dark grayish brown. It is gravelly loam or cobbly loam. In some places there is no B horizon. The B and C horizons are 35 to 60 percent coarse fragments, by volume. The Cca horizon has 40 to 60 percent calcium carbonate equivalent.

Work series

The Work series consists of deep, well drained soils that formed in alluvium. These soils are on terraces and fans on uplands at an elevation of 2,800 to 4,000 feet. Slopes are 0 to 8 percent. The average annual precipitation is 13 to 18 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Work clay loam, in cropland, 1,600 feet east and 500 feet south of the NW corner of sec. 24, T. 27 N., R. 20 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and plastic; many fine roots; common unstained silt and sand grains; mildly alkaline; clear smooth boundary.

B2t—6 to 13 inches; dark brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong medium and fine angular blocky; very hard, firm, sticky and plastic; many fine and very fine roots; common fine and very fine pores; thin continuous clay films; mildly alkaline; clear smooth boundary.

B3tca—13 to 19 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to weak medium angular blocky; hard, friable, sticky and plastic; common to many fine and very fine roots; common fine and very fine pores; thin discontinuous clay films on vertical faces of peds; 5 percent pebbles, by volume; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1ca—19 to 29 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, sticky and

plastic; few to common fine roots; many fine and very fine pores; 10 percent pebbles, by volume; many soft masses of lime and lime coats on gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—29 to 42 inches; pale brown (10YR 5/3) gravelly clay loam, dark brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; many fine pores; 20 percent pebbles, by volume; few soft masses of lime; lime coats on undersides of pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3—42 to 60 inches; pale brown (10YR 6/3) gravelly clay loam, dark brown (10YR 4/3) moist; massive; hard, very friable, sticky and slightly plastic; 30 percent pebbles, by volume; lime coats on undersides of pebbles; strongly effervescent; moderately alkaline.

The mollic epipedon is 10 to 14 inches thick. The A horizon is dark brown, brown, or grayish brown. The B horizon is dark brown, grayish brown, or dark grayish brown; it is clay loam or clay with 36 to 45 percent clay. The C horizon, below a depth of 26 inches, is clay loam, gravelly clay loam, or gravelly loam.

Yamac series

The Yamac series consists of deep, well drained soils that formed in alluvium. These soils are on fans, foot slopes, and terraces on uplands at an elevation of 2,300 to 3,600 feet. Slopes are 0 to 25 percent. The average annual precipitation is 10 to 14 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 105 to 125 days.

Typical pedon of Yamac loam, in native grass, 2,600 feet east and 2,560 feet north of the SW corner of sec. 18, T. 27 N., R. 21 E.

A1—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many fine pores; mildly alkaline; clear smooth boundary.

B2—4 to 11 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine and very fine pores; mildly alkaline; clear wavy boundary.

C1ca—11 to 26 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and very fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—26 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots in upper part; few fine pores; strongly effervescent; strongly alkaline.

The A horizon is brown or grayish brown. The B horizon is grayish brown to olive. The C horizon is loam, but in some places it has thin strata of sandy loam or silt loam. The A and B horizons are neutral or mildly alkaline. The C horizon is mildly alkaline to strongly alkaline.

Zahill series

The Zahill series consists of deep, well drained soils that formed in glacial till. These soils are on uplands at an elevation of 2,400 to 4,000 feet. Slopes are 8 to 45 percent. The average annual precipitation is 13 to 17 inches. The average annual temperature is 41 to 45 degrees F., and the growing season is 100 to 125 days.

Typical pedon of Zahill clay loam, in native grass, 1,800 feet south and 800 feet west of the NE corner of sec. 25, T. 29 N., R. 21 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine roots; many fine pores; mildly alkaline; clear smooth boundary.

AC—3 to 12 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; many fine roots; few fine pores; 5 percent fine pebbles, by volume; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C1ca—12 to 36 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; very hard, friable, sticky and plastic; few to common fine roots; few fine pores; 5 percent fine pebbles, by volume; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—36 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; hard, friable, sticky and plastic; few fine pores; 5 percent fine pebbles, by volume; common medium soft masses of lime; strongly effervescent; moderately alkaline.

The A horizon is grayish brown or dark grayish brown. The C horizon is clay loam or loam.

formation of the soils

George B. Hiltz and Arial Anderson, soil scientists, Soil Conservation Service, prepared this section.

In this section, the five factors that affect the formation of soils are discussed.

factors of soil formation

Soil is composed of mineral matter mixed with varying amounts of organic matter derived from vegetation. The mineral matter is derived from parent material that has been weathered and broken down by the combined effect of climate, living organisms, and topography through a long period of time. Within short distances, the combination of these factors varies. Consequently, the soils that form have different fertility, productivity, and physical and chemical characteristics.

parent material

About two-thirds of the soils in the survey area formed in glacial till or in glacial outwash material. Some of the soils formed in alluvium derived from mixed sources, and other soils formed in material that weathered from shale, sandstone, limestone, or igneous rocks. Soils that formed in soft sandstone, such as the Twilight soils, are generally sandy; soils that formed over hard rock, such as the Castner soils, are generally loamy and have a high content of rock fragments. Soils that formed in soft shale or siltstone, such as the Delpoint and Cabbart soils, are generally loamy; soils that formed in clay shale or mudstone, such as the Lisam and Bascovy soils, are generally clayey. Soils that formed in alluvium range from sandy, for example, the Glendive soils, to clayey, for example, the Harlem soils. Many soils in the survey area have accumulated lime and salt from the parent material. Soils that formed in outwash material generally have a high percentage of sand and rock fragments.

climate

Climate is an active force in the formation of soils, mainly through the effects of temperature and precipitation, although wind has some influence. Erosion and alternate freezing and thawing break down rocks into material in which soils form. The weathered material is further broken down by chemical reactions, such as solution and hydration. In this survey area, the annual precipitation ranges from about 10 to 25 inches. In the driest and warmest parts of the survey area there are

soils of the Aridisol order, such as those in the Phillips series. In cooler and wetter parts of the survey area there are soils of the Mollisol order, such as those of the Bearpaw and Belain series.

living organisms

Living organisms are an active force in the formation of soils. Organic matter is the main source of the dark color of the surface layer. However, some soils, such as those in the Belain series, get their dark color from dark minerals as well as from organic matter. Fungi and algae are among the earliest inhabitants of rock material. They contribute to the decomposition of rocks. As the rocks decompose, grasses, shrubs, and trees are able to grow and support animal life.

The kinds of plants and animals present largely determine the kind and amount of organic matter added to the soil and how this matter is incorporated with the mineral part of the soil. Roots, rodents, and insects penetrate the soil and influence its structure. Leaves, roots, and whole plants, on the surface or in the surface layer, are changed to humus by microorganisms, chemicals in the soil, and insects.

The vegetation in the survey area ranges from short and mid grasses and shrubs in most areas to aspen, ponderosa pine, and Douglas-fir trees in the Bearpaw Mountains and the Little Rocky Mountains. Mounds of earth on the ground surface have been dug up from underlying layers by burrowing rodents.

topography

Topography, or relief, is determined by the resistance of bedrock to erosion by wind and water. On eroded uplands in the survey area, runoff water has carved deep valleys into the bedrock formations. The rugged relief contrasts sharply with the nearly level relief of the terraces and flood plains of the river valleys.

On uplands, the number and the distinctness of soil horizons generally decrease as the slope increases. Exceptions to this are the soils of the Macmeal and Whitecow series, which formed on steep mountainsides. Steep soils that have rapid runoff have many characteristics similar to those of soils formed in arid climates. Level soils that receive runoff water from overlying areas have many of the characteristics of soils

that formed in humid climates. An example of this pattern is the shallow Cabbart soil that has steep slopes and the deep Dimmick soil in glacial depressions. The Cabbart soil has a thin, light-colored A horizon, and the Dimmick soil has a thick, dark-colored A horizon.

time

Soil genesis is that phase of soil science that deals with the factors and processes of soil formation. These processes give the soil distinct horizons, or layers, by which it can be recognized.

Soils are classified as young to mature. The age of a soil is determined by the thickness of the A horizon, the content of organic matter and of clay, the depth to which

soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Havre loam, a soil of the Entisol order, is an example of a young soil. It is on a flood plain adjacent to a flowing stream. The soil contains little organic matter with which to form an A horizon, it has no clay accumulation, and little translocation of carbonates has occurred to form B2 and Cca horizons.

The Farnuf soils formed in parent material similar to but much older than that of Havre loam. The Farnuf soils formed in alluvium on uplands and are mature soils of the Mollisol order. They contain enough organic matter to have a dark A horizon. Also, they have a distinct clay accumulation in a B2t horizon, and nearly all the carbonates have been leached from the solum.

references

- (1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.
- (2) American Association for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.
- (3) Krall, James L., and Johnson, Wally. 1975. Annual progress report to the Montana Department of State Lands. Helena, Montana. Montana Agric. Exp. Stn. Res. Rep. 95, January 1976.
- (4) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]
- (5) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	<i>Inches</i>
Very low.....	0 to 3
Low.....	3 to 6
Moderate.....	6 to 9
High.....	9 to 12
Very high.....	More than 12

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and

bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form

a “wire” when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for

significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the

building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike

that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms

are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percolates slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow.....	less than 0.06 inch
Slow.....	0.06 to 0.20 inch
Moderately slow.....	0.2 to 0.6 inch
Moderate.....	0.6 inch to 2.0 inches
Moderately rapid.....	2.0 to 6.0 inches
Rapid.....	6.0 to 20 inches
Very rapid.....	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid.....	Below 4.5
Very strongly acid.....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Medium acid.....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral.....	6.6 to 7.3
Mildly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4
Strongly alkaline.....	8.5 to 9.0
Very strongly alkaline.....	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils,

slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity are—

	SAR
Slight.....	Less than 13:1
Moderate.....	13-30:1
Strong.....	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millime- ters
Very coarse sand.....	2.0 to 1.0
Coarse sand.....	1.0 to 0.5
Medium sand.....	0.5 to 0.25
Fine sand.....	0.25 to 0.10
Very fine sand.....	0.10 to 0.05
Silt.....	0.05 to 0.002
Clay.....	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one

fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended

mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily

rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wetting depth. Depth to which a soil is wetted by normal precipitation.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days ¹	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	<u>OF</u>	<u>OF</u>	<u>OF</u>	<u>OF</u>	<u>OF</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>		<u>In</u>
Recorded in the period 1951-75 at Chinook, Montana											
January----	23.9	1.0	12.5	58	-39	33	.63	.23	.95	3	9.2
February----	31.9	8.3	20.3	61	-31	38	.37	.17	.53	2	4.8
March-----	41.6	16.3	28.9	72	-24	107	.41	.08	.67	2	5.1
April-----	57.2	29.3	43.2	84	3	187	1.29	.44	1.96	4	1.7
May-----	69.8	41.0	55.4	91	24	477	1.82	.77	2.66	5	.0
June-----	77.6	48.9	63.3	97	34	699	2.34	1.35	3.13	7	.0
July-----	86.3	53.2	69.8	102	40	924	1.40	.52	2.10	4	.0
August-----	84.7	51.3	68.0	101	37	868	1.23	.25	2.00	3	.0
September--	72.8	40.8	56.8	95	23	504	.97	.31	1.48	3	.1
October----	62.3	31.6	47.0	87	12	257	.58	.16	.90	2	.3
November---	42.9	18.5	30.7	69	-21	83	.47	.10	.75	2	3.3
December---	30.5	7.9	19.2	61	-31	49	.48	.11	.76	2	4.6
Year-----	56.8	29.0	42.9	103	-40	4,226	11.99	9.22	14.38	39	29.1
Recorded in the period 1960-75 at Cleveland, Montana											
January----	27.5	3.5	15.5	58	-32	34	.68	.13	1.11	3	9.2
February----	35.1	11.2	23.2	62	-26	19	.37	.13	.56	1	4.9
March-----	41.1	17.3	29.2	69	-21	74	.68	.21	1.04	2	8.4
April-----	53.1	28.7	40.9	78	2	157	2.09	.94	3.02	4	17.2
May-----	64.8	39.3	52.1	89	21	375	2.29	.93	3.38	5	2.4
June-----	73.6	47.8	60.8	92	32	624	3.10	1.78	4.17	7	.1
July-----	82.6	52.0	67.3	98	37	846	1.43	.59	2.13	4	.0
August-----	80.9	50.8	65.7	99	34	797	1.59	.29	2.60	3	.0
September--	69.1	40.6	54.9	91	22	463	1.11	.30	1.75	3	.3
October----	59.4	32.1	45.8	84	9	235	.75	.20	1.16	2	1.6
November---	44.1	19.2	31.7	70	-17	34	.41	.15	.62	1	4.3
December---	32.4	8.8	20.6	59	-30	26	.53	.29	.72	3	7.4
Year-----	53.3	29.3	42.3	99	-37	3,684	15.03	11.36	18.44	38	55.8

¹A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL.

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-75 at Chinook, Montana			
Last freezing temperature in spring:			
1 year in 10 later than--	May 6	May 16	May 28
2 years in 10 later than--	May 1	May 13	May 24
5 years in 10 later than--	April 21	May 3	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	September 20	September 8	September 2
2 years in 10 earlier than--	September 27	September 13	September 7
5 years in 10 earlier than--	October 9	September 23	September 16
Recorded in the period 1960-75 at Cleveland, Montana			
Last freezing temperature in spring:			
1 year in 10 later than--	May 12	May 23	June 3
2 years in 10 later than--	May 6	May 19	May 29
5 years in 10 later than--	April 25	May 11	May 21
First freezing temperature in fall:			
1 year in 10 earlier than--	September 15	September 6	September 3
2 years in 10 earlier than--	September 22	September 13	September 8
5 years in 10 earlier than--	October 6	September 27	September 19

TABLE 3.--GROWING SEASON

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
Recorded in the period 1951-75 at Chinook, Montana			
9 years in 10	148	122	105
8 years in 10	156	129	111
5 years in 10	171	142	122
2 years in 10	155	225	133
1 year in 10	193	162	138
Recorded in the period 1960-75 at Cleveland, Montana			
9 years in 10	134	114	99
8 years in 10	144	122	106
5 years in 10	164	138	121
2 years in 10	183	153	135
1 year in 10	193	161	143

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Absher-Nobe complex, 0 to 4 percent slopes-----	4,902	0.2
2	Assinniboine fine sandy loam, 0 to 4 percent slopes-----	8,274	0.3
3	Attewan loam, 0 to 4 percent slopes-----	19,307	0.7
4	Attewan-Beaverell complex, 0 to 4 percent slopes-----	21,694	0.8
5	Attewan-Wabek complex, 0 to 4 percent slopes-----	3,859	0.1
6	Badland*-----	47,338	1.7
7	Barkof clay, 4 to 8 percent slopes-----	5,508	0.2
8	Barkof-Norbert clays, 2 to 8 percent slopes-----	1,494	0.1
9	Barkof-Norbert clays, 8 to 20 percent slopes-----	8,420	0.3
10	Barkof-Windham association, moderately steep*-----	19,824	0.7
11	Bascovy clay, 2 to 6 percent slopes-----	15,244	0.5
12	Bascovy-Lisam-Dilts clays, 2 to 8 percent slopes-----	4,741	0.2
13	Bearpaw clay loam, 0 to 4 percent slopes-----	19,932	0.7
14	Bearpaw-Elloam clay loams, 0 to 4 percent slopes-----	19,703	0.7
15	Bearpaw-Elloam clay loams, 4 to 8 percent slopes-----	10,683	0.4
16	Bearpaw-Vida clay loams, 0 to 4 percent slopes-----	20,526	0.7
17	Bearpaw-Vida clay loams, 4 to 8 percent slopes-----	148,751	5.2
18	Belain loam, 2 to 8 percent slopes-----	2,754	0.1
19	Benz loam, 0 to 4 percent slopes-----	7,345	0.3
20	Bowdoin clay-----	10,155	0.4
21	Cabba loam, 8 to 35 percent slopes-----	4,996	0.2
22	Cabba-Rock outcrop complex, 25 to 75 percent slopes*-----	1,869	0.1
23	Cabba-Windham association, steep*-----	7,547	0.3
24	Cabba-Zahill association, steep*-----	11,891	0.4
25	Cabbart-Delpoint loams, 8 to 35 percent slopes-----	23,806	0.8
26	Cabbart-Hillon association, steep*-----	28,845	1.0
27	Cabbart-Rock outcrop, shale complex, 25 to 60 percent slopes*-----	43,325	1.5
28	Cabbart-Yamac-Rock outcrop complex, 15 to 70 percent slopes*-----	6,589	0.2
29	Castner gravelly loam, 8 to 35 percent slopes-----	5,203	0.2
30	Castner-Perma-Rock outcrop complex, 25 to 70 percent slopes*-----	41,651	1.5
31	Chinook fine sandy loam, 2 to 6 percent slopes-----	5,808	0.2
32	Chinook fine sandy loam, 6 to 12 percent slopes-----	4,295	0.2
33	Chinook-Phillips complex, 2 to 6 percent slopes-----	1,554	0.1
34	Cozberg fine sandy loam, 0 to 4 percent slopes-----	8,508	0.3
35	Creed loam, 0 to 4 percent slopes-----	1,986	0.1
36	Creed-Gerdrum complex, 0 to 4 percent slopes-----	17,513	0.6
37	Delpoint loam, 2 to 4 percent slopes-----	1,118	**
38	Delpoint-Cabbart loams, 2 to 8 percent slopes-----	11,654	0.4
39	Dimmick clay-----	5,597	0.2
40	Elloam clay loam, 0 to 4 percent slopes-----	26,924	0.9
41	Ethridge silty clay loam, 0 to 4 percent slopes-----	14,765	0.5
42	Ethridge-Gerdrum complex, 0 to 4 percent slopes-----	8,440	0.3
43	Farnuf loam, 0 to 2 percent slopes-----	2,028	0.1
44	Farnuf loam, 2 to 4 percent slopes-----	6,881	0.2
45	Farnuf loam, 4 to 8 percent slopes-----	1,905	0.1
46	Gerdrum clay loam, 0 to 4 percent slopes-----	1,885	0.1
47	Glendive fine sandy loam-----	8,989	0.3
48	Hanly loamy fine sand-----	9,186	0.3
49	Harlem loam-----	2,196	0.1
50	Harlem silty clay loam-----	11,051	0.4
51	Harlem silty clay loam, saline-----	6,586	0.2
52	Harlem silty clay-----	11,639	0.4
53	Harlem silty clay, saline-----	16,442	0.6
54	Harlem Variant-Lardell silty clay loams-----	5,438	0.2
55	Havre loam-----	21,224	0.7
56	Havre loam, saline-----	7,091	0.2
57	Havre silty clay loam-----	5,184	0.2
58	Havre silty clay loam, saline-----	2,540	0.1
59	Havre, Hanly and Glendive soils, channeled*-----	35,808	1.3
60	Havre Variant-Lardell silty clay loams-----	7,613	0.3
61	Hedoes loam, 2 to 4 percent slopes-----	3,527	0.1
62	Hedoes loam, 4 to 8 percent slopes-----	6,612	0.2
63	Hedoes-Belain loams, 4 to 15 percent slopes-----	9,107	0.3
64	Hedoes-Belain loams, 15 to 35 percent slopes-----	34,586	1.2
65	Hedoes-Belain-Castner complex, 15 to 60 percent slopes*-----	79,848	2.8
66	Hedoes-Benz loams, 2 to 4 percent slopes-----	1,675	0.1
67	Hillon clay loam, 25 to 45 percent slopes-----	60,856	2.1
68	Hillon-Kevin clay loams, 15 to 35 percent slopes-----	74,389	2.6
69	Hillon-Scobey clay loams, 4 to 20 percent slopes-----	11,298	0.4

See footnotes at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
70	Judith-Windham complex, 4 to 8 percent slopes-----	1,712	0.1
71	Judith-Windham complex, 8 to 15 percent slopes-----	947	**
72	Kevin clay loam, 2 to 8 percent slopes-----	8,227	0.3
73	Kevin-Elloam clay loams, 2 to 8 percent slopes-----	37,772	1.3
74	Kevin-Hillon clay loams, 8 to 15 percent slopes-----	12,445	0.4
75	Korent-Nesda complex, occasionally flooded-----	1,267	**
76	Lardell silty clay loam-----	8,460	0.3
77	Lihen loamy fine sand, 0 to 6 percent slopes-----	2,756	0.1
78	Lihen loamy fine sand, 6 to 12 percent slopes-----	1,007	**
79	Lisam-Dilts clays, 8 to 35 percent slopes-----	80,255	2.8
80	Lisam-Dilts-Rock outcrop, shale complex, 25 to 60 percent slopes*-----	117,776	4.1
81	Lisam-Hillon association, steep*-----	47,310	1.7
82	Lisam-Wabek association, steep*-----	7,104	0.2
83	Lolo loam-----	2,282	0.1
84	Macmeal association, steep*-----	6,166	0.2
85	Marmarth-Cabbart complex, 2 to 8 percent slopes-----	5,744	0.2
86	Martinsdale clay loam, 0 to 4 percent slopes-----	15,622	0.5
87	Martinsdale-Judith complex, 2 to 8 percent slopes-----	4,367	0.2
88	Marvan clay, 0 to 4 percent slopes-----	13,954	0.5
89	Marvan-Bascovy clays, 2 to 8 percent slopes-----	8,744	0.3
90	Nishon loam-----	2,042	0.1
91	Nishon clay loam-----	6,795	0.2
92	Norbert clay, 8 to 35 percent slopes-----	2,980	0.1
93	Norbert-Rock outcrop, shale complex, 25 to 60 percent slopes*-----	1,278	**
94	Perma-Castner-Belain complex, 25 to 60 percent slopes-----	57,806	2.0
95	Phillips loam, 0 to 4 percent slopes-----	13,618	0.5
96	Phillips loam, 4 to 8 percent slopes-----	1,182	**
97	Phillips-Elloam complex, 0 to 4 percent slopes-----	298,723	10.5
98	Phillips-Elloam complex, 4 to 8 percent slopes-----	31,643	1.1
99	Phillips-Kevin complex, 0 to 4 percent slopes-----	26,065	0.9
100	Phillips-Kevin complex, 4 to 8 percent slopes-----	38,902	1.4
101	Pits, gravel-----	92	**
102	Reeder loam, 2 to 4 percent slopes-----	1,130	**
103	Reeder loam, 4 to 8 percent slopes-----	2,598	0.1
104	Rubble land-Rock outcrop association*-----	1,150	**
105	Savage silty clay loam, 0 to 2 percent slopes-----	6,067	0.2
106	Savage silty clay loam, 2 to 4 percent slopes-----	4,529	0.2
107	Savage-Gerdrum silty clay loams, 0 to 4 percent slopes-----	4,186	0.1
108	Scobey clay loam, 0 to 4 percent slopes-----	9,277	0.3
109	Scobey-Kevin clay loams, 0 to 4 percent slopes-----	18,958	0.7
110	Scobey-Kevin clay loams, 4 to 8 percent slopes-----	85,414	3.0
111	Shaak loam, 0 to 4 percent slopes-----	6,798	0.2
112	Shaak-Gerdrum complex, 0 to 4 percent slopes-----	3,298	0.1
113	Shawmut gravelly loam, 0 to 4 percent slopes-----	5,108	0.2
114	Shawmut gravelly loam, 4 to 8 percent slopes-----	4,173	0.1
115	Silverchief-Whitecow-Macmeal association steep*-----	2,690	0.1
116	Straw-Korent loams-----	7,042	0.2
117	Straw-Korent loams, occasionally flooded-----	2,367	0.1
118	Straw and Nesda soils, channeled*-----	10,203	0.4
119	Telstad loam, 0 to 4 percent slopes-----	145,054	5.1
120	Telstad-Joplin loams, 0 to 4 percent slopes-----	42,559	1.5
121	Telstad-Joplin loams, 4 to 8 percent slopes-----	40,133	1.4
122	Telstad-Joplin gravelly loams, 0 to 4 percent slopes-----	7,470	0.3
123	Thoeny-Elloam complex, 0 to 4 percent slopes-----	116,698	4.1
124	Thoeny-Kevin-Elloam complex, 4 to 8 percent slopes-----	14,706	0.5
125	Turner loam, 0 to 4 percent slopes-----	9,803	0.3
126	Turner-Beaverton complex, 2 to 8 percent slopes-----	1,997	0.1
127	Twilight-Riedel fine sandy loams, 4 to 8 percent slopes-----	2,805	0.1
128	Twilight-Riedel fine sandy loams, 8 to 20 percent slopes-----	3,088	0.1
129	Typic Fluvaquents, 0 to 2 percent slopes-----	1,317	**
130	Typic Ustifluvents, wet*-----	6,309	0.2
131	Ustic Torrifluvents, wet*-----	8,677	0.3
132	Vanda clay, 0 to 2 percent slopes-----	9,903	0.3
133	Vanda-Nobe clays, 0 to 2 percent slopes-----	12,520	0.4
134	Vanda-Nobe clays, 2 to 8 percent slopes-----	1,718	0.1
135	Vida clay loam, 4 to 8 percent slopes-----	4,024	0.1
136	Vida-Zahill clay loams, 8 to 15 percent slopes-----	22,665	0.8
137	Wabek gravelly loam, 8 to 35 percent slopes-----	9,576	0.3

See footnotes at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
138	Warneke-Whitecow-Rock outcrop complex, 35 to 70 percent slopes*-----	4,904	0.2
139	Whitecow-Warneke gravelly loams, 25 to 60 percent slopes*-----	4,634	0.2
140	Whitecow association, steep*-----	9,726	0.3
141	Williams loam, 0 to 4 percent slopes-----	9,993	0.4
142	Williams-Vida loams, 0 to 4 percent slopes-----	40,534	1.4
143	Williams-Vida loams, 4 to 8 percent slopes-----	31,512	1.1
144	Windham cobbly loam, 15 to 45 percent slopes-----	3,842	0.1
145	Work clay loam, 0 to 4 percent slopes-----	6,461	0.2
146	Work clay loam, 4 to 8 percent slopes-----	1,228	**
147	Yamac loam, 2 to 4 percent slopes-----	785	**
148	Yamac-Benz loams, 0 to 4 percent slopes-----	5,201	0.2
149	Yamac-Wabek association, moderately steep*-----	2,224	0.1
150	Zahill clay loam, 25 to 45 percent slopes-----	30,101	1.1
151	Zahill-Vida clay loams, 15 to 35 percent slopes-----	59,904	2.1
	Water-----	4,304	0.2
	Total-----	2,846,328	100.0

* Broadly defined map unit.

** Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield figure indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils used for crops are listed]

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Oats		Alfalfa hay		Sugar beets		Corn silage	
	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Ton	I Ton	N Ton	I Ton	N Ton	I Ton
2----- Assinniboine	30	---	25	---	35	---	52	---	1.5	---	---	---	---	---
3----- Attewan	30	---	25	50	40	80	56	100	1.3	4.0	---	22	---	25
4----- Attewan-Beaverell	25	---	20	40	32	60	50	70	1.1	3.8	---	---	---	---
7----- Barkof	22	---	18	---	28	---	45	---	0.8	---	---	---	---	---
11----- Bascovy	18	---	16	---	24	---	40	---	0.7	---	---	---	---	---
13----- Bearpaw	40	---	35	---	50	---	64	---	2.0	5.5	---	---	---	---
14----- Bearpaw-Elloam	34	---	30	---	44	---	56	---	1.5	---	---	---	---	---
15----- Bearpaw-Elloam	32	---	28	---	42	---	54	---	1.3	---	---	---	---	---
16----- Bearpaw-Vida	38	---	34	---	48	---	62	---	2.0	5.2	---	---	---	---
17----- Bearpaw-Vida	36	---	32	---	45	---	60	---	1.9	5.0	---	---	---	---
18----- Belain	26	---	20	---	30	---	46	---	2.0	4.5	---	---	---	---
31----- Chinook	32	---	27	---	38	---	52	---	1.2	---	---	---	---	---
32----- Chinook	27	---	22	---	34	---	48	---	1.0	---	---	---	---	---
33----- Chinook-Phillips	31	---	26	---	37	---	50	---	1.1	---	---	---	---	---
34----- Cozberg	17	---	15	---	22	---	30	---	0.6	---	---	---	---	---
35----- Creed	18	---	15	---	25	---	35	---	---	---	---	---	---	---
36----- Creed-Gerdum	16	---	13	---	22	---	30	---	---	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Oats		Alfalfa hay		Sugar beets		Corn silage	
	N	I	N	I	N	I	N	I	N	I	N	I	N	I
	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton	Ton	Ton
37----- Delpoint	32	---	25	---	38	---	55	---	1.2	---	---	---	---	---
38----- Delpoint-Cabbart	22	---	18	---	30	---	42	---	0.8	---	---	---	---	---
40----- Elloam	16	---	13	---	22	---	30	---	---	---	---	---	---	---
41----- Ethridge	38	---	28	---	46	---	60	---	2.0	5.3	---	---	---	---
42----- Ethridge-Gerdrum	32	---	25	---	38	---	52	---	1.5	---	---	---	---	---
43, 44----- Farnuf	45	---	35	65	55	95	70	120	2.5	5.5	---	22	5	26
45----- Farnuf	40	---	32	---	50	---	65	---	2.0	5.3	---	---	---	---
46----- Gerdrum	14	---	12	---	18	---	28	---	---	---	---	---	---	---
47----- Glendive	30	---	25	45	35	60	48	80	1.5	5.0	---	22	---	25
48----- Hanly	---	---	---	---	---	---	---	---	---	2.5	---	---	---	---
49, 50----- Harlem	34	---	27	60	40	70	65	85	1.5	5.5	---	22	---	25
51----- Harlem	18	---	16	40	28	55	45	68	---	4.0	---	14	---	16
52----- Harlem	30	---	22	50	35	60	52	70	1.3	5.0	---	20	---	22
53----- Harlem	16	---	14	35	23	45	38	60	---	3.5	---	9	---	14
55, 57----- Havre	35	---	27	60	40	80	65	90	1.5	6.0	---	22	---	25
56, 58----- Havre	18	---	16	40	30	60	50	70	---	4.0	---	16	---	18
61----- Hedoes	---	---	30	---	42	75	55	80	2.0	4.5	---	---	---	---
62----- Hedoes	---	---	26	---	40	70	50	75	2.0	4.5	---	---	---	---
63----- Hedoes-Belain	---	---	20	---	32	60	40	65	1.8	4.0	---	---	---	---
66----- Hedoes-Benz	---	---	18	---	32	---	40	---	1.0	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Oats		Alfalfa hay		Sugar beets		Corn silage	
	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Ton	I Ton	N Ton	I Ton	N Ton	I Ton
69----- Hillon-Scobey	31	---	27	---	40	---	55	---	1.4	---	---	---	---	---
70----- Judith-Windham	24	---	18	---	29	---	46	---	0.6	---	---	---	---	---
72----- Kevin	30	---	25	---	35	---	52	---	1.0	4.2	---	---	---	---
73----- Kevin-Elloam	28	---	23	---	32	---	48	---	0.8	---	---	---	---	---
74----- Kevin-Hillon	27	---	21	---	30	---	45	---	0.8	---	---	---	---	---
77----- Lihen	25	---	20	35	30	45	40	60	1.2	4.0	---	---	---	---
83----- Lolo	---	---	33	58	42	72	53	80	2.0	5.3	---	---	---	---
85----- Marmarth-Cabbart	24	---	18	---	30	---	45	---	0.9	---	---	---	---	---
86----- Martinsdale	38	---	30	---	50	---	60	---	1.8	---	---	---	---	---
87----- Martinsdale-Judith	32	---	26	---	38	---	50	---	1.2	---	---	---	---	---
88----- Marvan	18	---	14	30	25	45	40	58	0.5	2.5	---	---	---	---
89----- Marvan-Bascovy	---	---	13	---	23	---	38	---	0.6	---	---	---	---	---
90----- Nishon	---	---	35	---	45	---	60	---	---	---	---	---	---	---
95----- Phillips	30	---	25	---	40	---	55	---	1.5	---	---	---	---	---
96----- Phillips	28	---	23	---	38	---	52	---	1.4	---	---	---	---	---
97----- Phillips-Elloam	28	---	23	---	36	---	50	---	1.0	---	---	---	---	---
98----- Phillips-Elloam	26	---	21	---	35	---	48	---	1.0	---	---	---	---	---
99----- Phillips-Kevin	30	---	25	---	38	---	52	---	1.3	---	---	---	---	---
100----- Phillips-Kevin	28	---	24	---	37	---	50	---	1.2	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Oats		Alfalfa hay		Sugar beets		Corn silage	
	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Ton	I Ton	N Ton	I Ton	N Ton	I Ton
102----- Reeder	32	---	26	---	41	---	56	---	1.3	---	---	---	---	---
103----- Reeder	30	---	24	---	38	---	52	1.2	---	---	---	---	---	---
105----- Savage	42	---	35	62	55	90	70	115	2.2	5.5	---	22	5	26
106----- Savage	40	---	35	60	55	85	70	110	2.2	5.5	---	21	5	26
107----- Savage-Gerdum	33	---	28	---	46	---	62	---	1.5	---	---	---	---	---
108----- Scobey	35	---	28	50	44	75	60	85	1.5	5.5	---	---	---	---
109----- Scobey-Kevin	33	---	26	---	42	---	58	---	1.3	---	---	---	---	---
110----- Scobey-Kevin	31	---	24	---	38	---	54	---	1.2	---	---	---	---	---
111----- Shaak	34	---	26	---	42	---	58	---	1.4	---	---	---	---	---
112----- Shaak-Gerdum	26	---	22	---	35	---	50	---	1.0	---	---	---	---	---
113----- Shawmut	33	---	28	---	42	---	55	---	1.5	5.0	---	---	---	---
114----- Shawmut	30	---	25	---	40	---	52	---	1.3	4.5	---	---	---	---
116----- Straw-Korent	40	---	32	58	50	85	64	92	2.0	5.5	---	---	---	25
117----- Straw-Korent	---	---	---	---	---	---	---	---	---	5.0	---	---	---	---
119----- Telstad	35	---	30	---	45	---	60	---	1.4	5.5	---	---	---	---
120----- Telstad-Joplin	33	---	26	---	42	---	56	---	1.2	5.2	---	---	---	---
121----- Telstad-Joplin	30	---	24	---	38	---	52	---	1.1	---	---	---	---	---
122----- Telstad-Joplin	30	---	24	---	38	---	51	---	1.1	---	---	---	---	---
123----- Thoeny-Elloam	20	---	15	---	25	---	40	---	---	---	---	---	---	---

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Winter wheat		Spring wheat		Barley		Oats		Alfalfa hay		Sugar beets		Corn silage	
	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Bu	I Bu	N Ton	I Ton	N Ton	I Ton	N Ton	I Ton
124----- Thoeny-Kevin-Elloam	21	---	16	---	26	---	42	---	0.6	---	---	---	---	---
125----- Turner	30	---	24	45	38	75	52	85	1.4	4.5	---	---	---	---
126----- Turner-Beaverton	22	---	17	---	30	---	45	---	1.1	---	---	---	---	---
127----- Twilight-Riedel	20	---	15	---	28	---	40	---	0.8	---	---	---	---	---
135----- Vida	36	---	30	---	45	---	58	---	1.8	---	---	---	---	---
136----- Vida-Zahill	28	---	22	---	35	---	48	---	1.3	---	---	---	---	---
141----- Williams	38	---	33	---	49	---	62	---	2.0	---	---	---	---	---
142----- Williams-Vida	36	---	32	---	45	---	60	---	1.9	---	---	---	---	---
143----- Williams-Vida	32	---	27	---	40	---	55	---	1.8	---	---	---	---	---
145----- Work	42	---	37	62	50	85	62	110	2.0	5.5	---	---	---	---
146----- Work	40	---	35	---	46	---	58	---	1.8	---	---	---	---	---
147----- Yamac	34	---	27	---	40	---	55	---	1.5	---	---	---	---	---
148----- Yamac-Benz	18	---	15	---	24	---	35	---	0.7	---	---	---	---	---

TABLE 6.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1*: Absher-----	Severe: percs slowly.	Slight-----	Severe: percs slowly.	Slight.
Nobe-----	Moderate: too clayey, percs slowly.	Moderate: slope.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
2----- Assinniboine	Slight-----	Slight-----	Moderate: slope.	Slight.
3----- Attewan	Slight-----	Slight-----	Moderate: slope, small stones.	Slight.
4*: Attewan-----	Slight-----	Slight-----	Moderate: small stones.	Slight.
Beaverell-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
5*: Attewan-----	Slight-----	Slight-----	Moderate: slope, small stones.	Slight.
Wabek-----	Slight-----	Slight-----	Moderate: slope.	Slight.
6. Badland				
7----- Barkof	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, depth to rock.	Moderate: too clayey.
8*: Barkof-----	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, depth to rock.	Moderate: too clayey.
Norbert-----	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: too clayey, depth to rock.	Moderate: too clayey.
9*: Barkof-----	Moderate: too clayey, slope.	Moderate: too clayey, slope.	Severe: slope.	Severe: slope.
Norbert-----	Moderate: percs slowly, too clayey, slope.	Moderate: too clayey.	Severe: too clayey, slope.	Moderate: too clayey.
10*: Barkof.				
Windham-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
11----- Bascovy	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
12*: Bascovy-----	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, depth to rock.	Moderate: too clayey.
Lisam-----	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, depth to rock, slope.	Severe: too clayey.
Dilts-----	Severe: too clayey.	Severe: too clayey.	Severe: too clayey, depth to rock, slope.	Severe: too clayey.
13----- Bearpaw	Moderate: too clayey.	Moderate: too clayey.	Moderate: percs slowly, too clayey, slope.	Moderate: too clayey.
14*: Bearpaw-----	Moderate: too clayey.	Moderate: too clayey.	Moderate: percs slowly, too clayey, slope.	Moderate: too clayey.
Elloam-----	Moderate: percs slowly.	Slight-----	Moderate: slope, too clayey, percs slowly.	Slight.
15*: Bearpaw-----	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Elloam-----	Moderate: percs slowly.	Slight-----	Severe: slope.	Slight.
16*: Bearpaw-----	Moderate: too clayey.	Moderate: too clayey.	Moderate: percs slowly, too clayey, slope.	Moderate: too clayey.
Vida-----	Slight-----	Slight-----	Moderate: too clayey, slope.	Slight.
17*: Bearpaw-----	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Vida-----	Slight-----	Slight-----	Severe: slope.	Slight.
18----- Belain	Slight-----	Slight-----	Moderate: slope, small stones, depth to rock.	Slight.
19----- Benz	Slight-----	Slight-----	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
20----- Bowdoin	Severe: floods.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
21----- Cabba	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
22*: Cabba-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
23*: Cabba-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Windham-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
24*: Cabba-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
25*: Cabbart-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Delpoint-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
26*: Cabbart-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
27*: Cabbart-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
28*: Cabbart-----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Yamac-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop.				
29----- Castner	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
30*: Castner-----	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.
Perma-----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
Rock outcrop.				
31----- Chinook	Slight-----	Slight-----	Moderate: slope.	Slight.
32----- Chinook	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
33*: Chinook-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Phillips-----	Slight-----	Slight-----	Moderate: slope.	Slight.
34----- Cozberg	Slight-----	Slight-----	Moderate: slope.	Slight.
35----- Creed	Moderate: percs slowly.	Slight-----	Moderate: percs slowly, slope.	Slight.
36*: Creed-----	Moderate: percs slowly.	Slight-----	Moderate: percs slowly, slope.	Slight.
Gerdrum-----	Slight-----	Slight-----	Moderate: slope.	Slight.
37----- Delpoint	Slight-----	Slight-----	Moderate: slope.	Slight.
38*: Delpoint-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Cabbart-----	Slight-----	Slight-----	Severe: depth to rock.	Slight.
39----- Dimmick	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: floods, wetness, too clayey.	Severe: wetness, too clayey.
40----- Elloam	Moderate: percs slowly.	Slight-----	Moderate: slope, too clayey, percs slowly.	Slight.
41----- Ethridge	Slight-----	Slight-----	Moderate: slope, percs slowly, too clayey.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
42*: Ethridge-----	Slight-----	Slight-----	Moderate: slope, percs slowly, too clayey.	Slight.
Gerdrum-----	Slight-----	Slight-----	Moderate: slope.	Slight.
43----- Farnuf	Slight-----	Slight-----	Moderate: small stones.	Slight.
44----- Farnuf	Slight-----	Slight-----	Moderate: slope.	Slight.
45----- Farnuf	Slight-----	Slight-----	Severe: slope.	Slight.
46----- Gerdrum	Slight-----	Slight-----	Moderate: slope.	Slight.
47----- Glendive	Severe: floods.	Slight-----	Slight-----	Slight.
48----- Hanly	Severe: floods.	Slight-----	Moderate: floods.	Slight.
49----- Harlem	Severe: floods.	Slight-----	Slight-----	Slight.
50----- Harlem	Severe: floods.	Slight-----	Moderate: too clayey.	Slight.
51----- Harlem	Severe: floods.	Slight-----	Moderate: too clayey.	Slight.
52----- Harlem	Severe: floods.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
53----- Harlem	Severe: floods.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
54*: Harlem Variant-----	Severe: floods.	Moderate: too clayey, wetness.	Moderate: wetness, too clayey.	Moderate: too clayey.
Lardell-----	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
55----- Havre	Severe: floods.	Slight-----	Slight-----	Slight.
56----- Havre	Severe: floods.	Moderate: wetness.	Moderate: percs slowly, wetness.	Slight.
57----- Havre	Severe: floods.	Slight-----	Moderate: too clayey.	Slight.
58----- Havre	Severe: floods.		Moderate: too clayey, percs slowly, wetness.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
59*:				
Havre-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Hanly-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Glendive-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
60*:				
Havre Variant-----	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight.
Lardell-----	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
61-----				
Hedoes	Slight-----	Slight-----	Moderate: slope.	Slight.
62-----				
Hedoes	Slight-----	Slight-----	Severe: slope.	Slight.
63*:				
Hedoes-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Belain-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
64*:				
Hedoes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Belain-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65*:				
Hedoes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Belain-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Castner-----	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.
66*:				
Hedoes-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Benz-----	Slight-----	Slight-----	Moderate: slope.	Slight.
67-----				
Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
68*:				
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Kevin-----	Severe: slope.	Severe: slope.	Severe: slope.	

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
69*: Hillon-----	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
Scobey-----	Slight-----	Slight-----	Severe: slope.	Slight.
70*: Judith-----	Slight-----	Slight-----	Severe: slope.	Slight.
Windham-----	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: small stones.
71*: Judith-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Windham-----	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
72----- Kevin	Slight-----	Slight-----	Moderate: slope, too clayey.	Slight.
73*: Kevin-----	Slight-----	Slight-----	Moderate: slope, too clayey.	Slight.
Elloam-----	Moderate: percs slowly.	Slight-----	Moderate: slope, too clayey, percs slowly.	Slight.
74*: Kevin-----	Moderate: slope.	Moderate: slope.	Severe: slope.	
Hillon-----	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
75*: Korent-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Nesda-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
76----- Lardell	Severe: wetness, floods.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
77----- Lihen	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
78----- Lihen	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
79*: Lisam-----	Severe: too clayey, slope, percs slowly.	Severe: too clayey, slope.	Severe: too clayey, depth to rock, slope.	Severe: too clayey.
Dilts-----	Severe: too clayey. slope.	Severe: too clayey, slope.	Severe: too clayey, depth to rock, slope.	Severe: too clayey.
80*: Lisam-----	Severe: too clayey, slope, percs slowly.	Severe: too clayey, slope.	Severe: too clayey, depth to rock, slope.	Severe: too clayey, slope.
Dilts-----	Severe: too clayey, slope.	Severe: too clayey, slope.	Severe: too clayey, depth to rock, slope.	Severe: too clayey, slope.
Rock outcrop.				
81*: Lisam-----	Severe: too clayey, slope, percs slowly.	Severe: too clayey, slope.	Severe: too clayey, depth to rock, slope.	Severe: too clayey, slope.
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
82*: Lisam-----	Severe: too clayey, slope, percs slowly.	Severe: too clayey, slope.	Severe: too clayey, depth to rock, slope.	Severe: too clayey, slope.
Wabek-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
83----- Lolo	Slight-----	Slight-----	Moderate: small stones.	Slight.
84*: Macmeal-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
85*: Marmarth-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Cabbart-----	Slight-----	Slight-----	Severe: depth to rock.	Slight.
86----- Martinsdale	Moderate: percs slowly.	Slight-----	Moderate: slope.	Slight.
87*: Martinsdale-----	Moderate: percs slowly.	Slight-----	Moderate: slope.	Slight.
Judith-----	Slight-----	Slight-----	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
88----- Marvan	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
89*: Marvan-----	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
Bascovy-----	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
90, 91----- Nishon	Severe: floods, percs slowly, wetness.	Severe: wetness.	Severe: floods, percs slowly, wetness.	Moderate: floods, wetness.
92----- Norbert	Severe: slope.	Moderate: slope, too clayey.	Severe: too clayey, slope.	Moderate: slope, too clayey.
93*: Norbert-----	Severe: slope.	Moderate: slope, too clayey.	Severe: too clayey, slope.	Severe: slope.
Rock outcrop.				
94*: Perma-----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
Castner-----	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.
Belain-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
95----- Phillips	Slight-----	Slight-----	Moderate: slope.	Slight.
96----- Phillips	Slight-----	Slight-----	Severe: slope.	Slight.
97*: Phillips-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Elloam-----	Moderate: percs slowly.	Slight-----	Moderate: slope, too clayey, percs slowly.	Slight.
98*: Phillips-----	Slight-----	Slight-----	Severe: slope.	Slight.
Elloam-----	Moderate: percs slowly.	Slight-----	Severe: slope.	Slight.
99*: Phillips-----	Slight-----	Slight-----	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
99*: Kevin-----	Slight-----	Slight-----	Moderate: slope, too clayey.	Slight.
100*: Phillips-----	Slight-----	Slight-----	Severe: slope.	Slight.
Kevin-----	Slight-----	Slight-----	Severe: slope.	Slight.
101*. Pits				
102----- Reeder	Slight-----	Slight-----	Moderate: depth to rock, slope.	Slight.
103----- Reeder	Slight-----	Slight-----	Severe: slope.	Slight.
104: Rubble land. Rock outcrop.				
105----- Savage	Moderate: percs slowly.	Slight-----	Moderate: too clayey.	Slight.
106----- Savage	Moderate: percs slowly.	Slight-----	Moderate: slope.	Slight.
107*: Savage-----	Moderate: percs slowly.	Slight-----	Moderate: slope.	Slight.
Gerdrum-----	Slight-----	Slight-----	Moderate: slope.	Slight.
108----- Scobey	Slight-----	Slight-----	Moderate: slope, too clayey.	Slight.
109*: Scobey-----	Slight-----	Slight-----	Moderate: slope, too clayey.	Slight.
Kevin-----	Slight-----	Slight-----	Moderate: slope, too clayey.	
110*: Scobey-----	Slight-----	Slight-----	Severe: slope.	Slight.
Kevin-----	Slight-----	Slight-----	Severe: slope.	
111----- Shaak	Slight-----	Slight-----	Moderate: slope.	Slight.
112*: Shaak-----	Slight-----	Slight-----	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
112*: Gerdrum-----	Slight-----	Slight-----	Moderate: slope.	Slight.
113----- Shawmut	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
114----- Shawmut	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: small stones.
115*: Silverchief-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Whitecow-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
Macmeal-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
116*: Straw-----	Severe: floods.	Slight-----	Slight-----	Slight.
Korent-----	Severe: floods.	Slight-----	Slight-----	Slight.
117*: Straw-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Korent-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
118*: Straw-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
Nesda-----	Severe: floods.	Slight-----	Moderate: floods.	Slight.
119----- Telstad	Slight-----	Slight-----	Moderate: small stones.	Slight.
120*: Telstad-----	Slight-----	Slight-----	Moderate: small stones.	Slight.
Joplin-----	Slight-----	Slight-----	Moderate: slope.	Slight.
121*: Telstad-----	Slight-----	Slight-----	Severe: slope.	Slight.
Joplin-----	Slight-----	Slight-----	Severe: slope.	Slight.
122*: Telstad-----	Slight-----	Slight-----	Severe: small stones.	Slight.
Joplin-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
123*: Thoeny-----	Moderate: percs slowly.	Slight-----	Moderate: slope, percs slowly.	Slight.
Elloam-----	Moderate: percs slowly.	Slight-----	Moderate: slope, too clayey, percs slowly.	Slight.
124*: Thoeny-----	Moderate: percs slowly.	Slight-----	Severe: slope.	Slight.
Kevin-----	Slight-----	Slight-----	Severe: slope.	
Elloam-----	Moderate: percs slowly.	Slight-----	Severe: slope.	Slight.
125----- Turner	Slight-----	Slight-----	Moderate: slope.	Slight.
126*: Turner-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Beaverton-----	Moderate: small stones,	Moderate: small stones.	Severe: small stones, large stones.	Moderate: small stones.
127*: Twilight-----	Slight-----	Slight-----	Severe: slope.	Slight.
Riedel-----	Slight-----	Slight-----	Severe: slope.	Slight.
128*: Twilight-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Riedel-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
129. Typic Fluvaquents				
130. Typic Ustifluvents				
131. Ustic Torrifluvents				
132----- Vanda	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
133*, 134*: Vanda-----	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
Nobe-----	Moderate: too clayey, percs slowly.	Moderate: slope.	Moderate: too clayey, percs slowly.	Moderate: too clayey.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
135----- Vida	Slight-----	Slight-----	Severe: slope.	Slight.
136*: Vida-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Zahill-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
137----- Wabek	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
138*: Warneke-----	Severe: slope.	Severe: slope.	Severe: small stones, slope, depth to rock.	Severe: slope.
Whitecow-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
Rock outcrop.				
139*: Whitecow-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
Warneke-----	Severe: slope.	Severe: slope.	Severe: small stones, slope, depth to rock.	Severe: slope.
140*: Whitecow-----	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.
141----- Williams	Slight-----	Slight-----	Moderate: slope.	Slight.
142*: Williams-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Vida-----	Slight-----	Slight-----	Moderate: slope.	Slight.
143*: Williams-----	Slight-----	Slight-----	Severe: slope.	Slight.
Vida-----	Slight-----	Slight-----	Severe: slope.	Slight.
144----- Windham	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.
145----- Work	Slight-----	Slight-----	Moderate: slope, too clayey.	Moderate: too clayey.
146----- Work	Slight-----	Slight-----	Severe: slope.	Moderate: too clayey.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
147----- Yamac	Slight-----	Slight-----	Moderate: slope.	Slight.
148*: Yamac-----	Slight-----	Slight-----	Moderate: slope.	Slight.
Benz-----	Slight-----	Slight-----	Moderate: slope.	Slight.
149*: Yamac-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Wabek-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
150----- Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
151*: Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vida-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1*: Absher-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Nobe-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
2----- Assinniboine	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action, low strength.
3----- Attewan	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action, low strength.
4*: Attewan-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action, low strength.
Beaverell-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action.
5*: Attewan-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action, low strength.
Wabek-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
6. Badland					
7----- Barkof	Moderate: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
8*: Barkof-----	Moderate: depth to rock, too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Norbert-----	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
9*: Barkof-----	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength.
Norbert-----	Moderate: too clayey, depth to rock.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
10*: Barkof-----	Severe: slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Windham-----	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
11----- Bascovy	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
12*: Bascovy-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Lisam-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Dilts-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
13----- Bearpaw	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
14*, 15*: Bearpaw-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Elloam-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
16*: Bearpaw-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Vida-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
17*: Bearpaw-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Vida-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, low strength.	Severe: low strength.
18----- Belain	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.
19----- Benz	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
20----- Bowdoin	Moderate: too clayey.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, floods, low strength.	Severe: shrink-swell, low strength.
21----- Cabba	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
22*: Cabba----- Rock outcrop.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
23*: Cabba----- Windham-----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
24*: Cabba----- Zahill-----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.
25*: Cabbart----- Delpoint-----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
26*: Cabbart----- Hillon-----	Moderate: slope, depth to rock.	Moderate: slope, shrink-swell.	Moderate: slope, depth to rock, shrink-swell.	Severe: slope.	Moderate: slope, frost action.
27*: Cabbart----- Rock outcrop.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
28*: Cabbart----- Yamac----- Rock outcrop.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
29----- Castner	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
30*: Castner-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Perma----- Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
31----- Chinook	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.
32----- Chinook	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
33*: Chinook-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.
Phillips-----	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Severe: low strength.
34----- Cozberg	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action.
35----- Creed	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.
36*: Creed-----	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.
Gerdrum-----	Slight-----	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
37----- Delpoint	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell,
38*: Delpoint-----	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell,
Cabbart-----	Moderate: depth to rock, too clayey.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Moderate: frost action, depth to rock, low strength.
39----- Dimmick	Severe: floods, wetness, too clayey.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, low strength.
40----- Elloam	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
41----- Ethridge	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
42*: Ethridge-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Gerdrum-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
43, 44----- Farnuf	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
45----- Farnuf	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
46----- Gerdrum	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
47----- Glendive	Slight-----	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, floods.
48----- Hanly	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
49, 50----- Harlem	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
51----- Harlem	Moderate: wetness, too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: low strength, shrink-swell.
52----- Harlem	Moderate: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
53----- Harlem	Moderate: too clayey, wetness.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: low strength, shrink-swell.
54*: Harlem Variant-----	Severe: wetness.	Severe: shrink-swell, floods.	Severe: shrink-swell, wetness, floods.	Severe: shrink-swell, floods.	Severe: low strength, shrink-swell.
Lardell-----	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness.
55, 57----- Havre	Slight-----	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, low strength, floods.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
56, 58----- Havre	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, low strength.
59*: Havre-----	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Hanly-----	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Glendive-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
60*: Havre Variant-----	Severe: wetness.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: low strength.
Lardell-----	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness.
61----- Hedoes	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action.
62----- Hedoes	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.
63*: Hedoes-----	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.
Belain-----	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, frost action, depth to rock.
64*: Hedoes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Belain-----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
65*: Hedoes-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Belain-----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Castner-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
66*: Hedoes-----	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action.
Benz-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
67----- Hillon	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
68*: Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Kevin-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength.
69*: Hillon-----	Moderate: slope.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.
Scobey-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
70*: Judith-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action, shrink-swell.
Windham-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.
71*: Judith-----	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, low strength, frost action.
Windham-----	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
72----- Kevin	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
73*: Kevin-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Elloam-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
74*: Kevin-----	Moderate: slope.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.
Hillon-----	Moderate: slope.	Severe: shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: slope, shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
75*: Korent-----	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Nesda-----	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
76----- Lardell	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness.
77----- Lihen	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight.
78----- Lihen	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
79*: Lisam-----	Severe: slope, depth to rock.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, depth to rock, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Dilts-----	Severe: slope, depth to rock.	Severe: low strength, slope, shrink-swell.	Severe: shrink-swell, depth to rock, slope.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.
80*: Lisam-----	Severe: slope, depth to rock.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Dilts-----	Severe: slope, depth to rock.	Severe: low strength, slope, shrink-swell.	Severe: shrink-swell, depth to rock, slope.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.
Rock outcrop.					
81*: Lisam-----	Severe: slope, depth to rock.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, depth to rock, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Hillon-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
82*: Lisam-----	Severe: slope, depth to rock.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, depth to rock, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.
Wabek-----	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
83----- Lolo	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action.
84*: Macmeal-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
85*: Marmarth-----	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, frost action.
Cabbart-----	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: frost action, depth to rock, low strength.
86----- Martinsdale	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.
87*: Martinsdale-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, frost action.
Judith-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action, shrink-swell.
88----- Marvan	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
89*: Marvan-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Bascovy-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
90, 91----- Nishon	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.
92----- Norbert	Severe: slope, depth to rock.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, slope, low strength.
93*: Norbert-----	Severe: slope, depth to rock.	Severe: shrink-swell, slope, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, slope, low strength.
Rock outcrop.					
94*: Perma-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Castner-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Belain-----	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
95, 96----- Phillips	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Severe: low strength.
97*, 98*: Phillips-----	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Severe: low strength.
Elloam-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
99*: Phillips-----	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Severe: low strength.
Kevin-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
100*: Phillips-----	Slight-----	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Severe: low strength.
Kevin-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
101. Pits					
102----- Reeder	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, low strength.	Severe: low strength.
103----- Reeder	Moderate: depth to rock.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, depth to rock.	Moderate: shrink-swell, slope, low strength.	Severe: low strength.
104: Rubble land. Rock outcrop.					
105, 106----- Savage	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
107*: Savage-----	Moderate: too clayey.	Severe: low strength, shrink-swell.	Severe: low strength, shrink-swell.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Gerdrum-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
108----- Scobey	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
109*: Scobey-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Kevin-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
110*: Scobey-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Kevin-----	Slight----- too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
111----- Shaak	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength, shrink-swell.
112*: Shaak-----	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength, shrink-swell.
Gerdrum-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
113----- Shawmut	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action.
114----- Shawmut	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.
115*: Silverchief-----	Severe: slope.	Severe: slope, low strength, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: slope, shrink-swell, low strength.
Whitecow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Macmeal-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
116*: Straw-----	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, frost action, floods.
Korent-----	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength, frost action.
117*: Straw-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Korent-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
118*: Straw-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Nesda-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
119----- Telstad	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
120*: Telstad-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Joplin-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
121*: Telstad-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Joplin-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
122*: Telstad-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Joplin-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
123*: Thoeny-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Elloam-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
124*: Thoeny-----	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Kevin-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
Elloam-----	Slight-----	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
125----- Turner	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
126*: Turner-----	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell.	Moderate: slope, low strength.	Severe: low strength.
Beaverton-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.
127*: Twilight-----	Moderate: depth to rock.	Slight-----	Moderate: depth to rock.	Moderate: slope.	Slight.
Riedel-----	Moderate: depth to rock.	Slight-----	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.
128*: Twilight-----	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
Riedel-----	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.
129. Typic Fluvaquents					
130. Typic Ustifluents					
131. Ustic Torrifluents					
132----- Vanda	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
133*, 134*: Vanda-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
Nobe-----	Moderate: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
135----- Vida	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, low strength.	Severe: low strength.
136*: Vida-----	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.
Zahill-----	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.
137----- Wabek	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
138*: Warneke-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Whitecow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
139*: Whitecow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Warneke-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
140*: Whitecow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
141----- Williams	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
142*: Williams-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
Vida-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
143*: Williams-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: low strength.
Vida-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, low strength.	Severe: low strength.
144----- Windham	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
145----- Work	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.
146----- Work	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
147----- Yamac	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action, low strength.
148*: Yamac-----	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: frost action, low strength.
Benz-----	Slight-----	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
149*: Yamac-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength.
Wabek-----	Severe: slope, outbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
150----- Zahill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
151*: Zahill-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Vida-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1*: Absher-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Nobe-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
2----- Assinniboine	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
3----- Attewan	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
4*: Attewan-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
Beaverell-----	Slight-----	Severe: seepage.	Severe: seepage,	Severe: seepage.	Poor: small stones.
5*: Attewan-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
Wabek-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
6. Badland					
7----- Barkof	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight-----	Poor: thin layer, area reclaim, too clayey.
8*: Barkof-----	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight-----	Poor: thin layer, area reclaim, too clayey.
Norbert-----	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight-----	Poor: too clayey, thin layer, area reclaim.
9*: Barkof-----	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: too clayey, thin layer, area reclaim.
Norbert-----	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: too clayey, thin layer, area reclaim.
10*: Barkof-----	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Moderate: slope.	Poor: too clayey, thin layer, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10*: Windham-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Moderate: slope.	Poor: slope, small stones.
11----- Bascovy	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight-----	Poor: too clayey, thin layer, area reclaim.
12*: Bascovy-----	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight-----	Poor: too clayey, thin layer, area reclaim.
Lisam-----	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight-----	Poor: too clayey, thin layer, area reclaim.
Dilts-----	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight-----	Poor: too clayey, thin layer, area reclaim.
13----- Bearpaw	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
14*, 15*: Bearpaw-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Elloam-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
16*, 17*: Bearpaw-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
18----- Belain	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
19----- Benz	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
20----- Bowdoin	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
21----- Cabba	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
22*: Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
23*: Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Windham-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Poor: slope, small stones.
24*: Cabba-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Zahill-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
25*: Cabbart-----	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Delpoint-----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
26*: Cabbart-----	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Hillon-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
27*: Cabbart-----	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
28*: Cabbart-----	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Yamac-----	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
29----- Castner	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer.
30*: Castner-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
30*: Perma-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
Rock outcrop.					
31----- Chinook	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
32----- Chinook	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope.
33*: Chinook-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Phillips-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
34----- Cozberg	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
35----- Creed	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
36*: Creed-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Gerdrum-----	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey.	Slight-----	Poor: too clayey.
37----- Delpoint	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
38*: Delpoint-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
Cabbart-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
39----- Dimmick	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: wetness, too clayey.
40----- Elloam	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
41----- Ethridge	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
42*: Ethridge-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Gerdrum-----	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey.	Slight-----	Poor: too clayey.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
43----- Farnuf	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
44, 45----- Farnuf	Severe: percs slowly.	Moderate: slope, seepage.	Slight-----	Slight-----	Fair: too clayey.
46----- Gerdrum	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey.	Slight-----	Poor: too clayey.
47----- Glendive	Moderate: floods.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Good.
48----- Hanly	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods.	Poor: seepage.
49, 50----- Harlem	Severe: percs slowly.	Severe: floods.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
51----- Harlem	Severe: wetness, percs slowly.	Severe: floods.	Severe: wetness.	Moderate: floods, wetness.	Fair: too clayey.
52----- Harlem	Severe: percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: too clayey.
53----- Harlem	Severe: wetness, percs slowly.	Severe: floods.	Severe: wetness.	Moderate: floods, wetness.	Fair: too clayey.
54*: Harlem Variant-----	Severe: percs slowly, wetness.	Severe: floods, wetness.	Severe: too clayey, wetness.	Moderate: wetness.	Poor: too clayey.
Lardell-----	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
55----- Havre	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
56----- Havre	Severe: wetness.	Severe: floods.	Severe: wetness.	Moderate: wetness, floods.	Good.
57----- Havre	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: too clayey.
58----- Havre	Severe: wetness.	Severe: floods.	Severe: wetness.	Moderate: wetness, floods.	Good.
59*: Havre-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Hanly-----	Severe: floods.	Severe: seepage, floods.	Severe: seepage, floods.	Severe: seepage, floods.	Poor: seepage.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
59*: Glendive-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
60*: Havre Variant-----	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Lardell-----	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
61, 62----- Hedoes	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
63*: Hedoes-----	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
Belain-----	Severe: depth to rock.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
64*: Hedoes-----	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
Belain-----	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, slope, area reclaim.
65*: Hedoes-----	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope.
Belain-----	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, slope, area reclaim.
Castner-----	Severe: slope, depth to rock.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, large stones.
66*: Hedoes-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
Benz-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
67----- Hillon	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
68*: Hillon-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
68*: Kevin-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
69*: Hillon-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Scobey-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
70*: Judith-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Windham-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Poor: small stones.
71*: Judith-----	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Windham-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: small stones.
72----- Kevin	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
73*: Kevin-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Elloam-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
74*: Kevin-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Hillon-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
75*: Korent-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Nesda-----	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones, area reclaim.
76----- Lardell	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
77----- Lihen	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
78----- Lihen	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
79*: Lisam-----	Severe: percs slowly, slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: too clayey, thin layer, slope.
Dilts-----	Severe: percs slowly, depth to rock, slope.	Severe: depth to rock, slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: too clayey, thin layer, slope.
80*: Lisam-----	Severe: percs slowly, slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: too clayey, thin layer, slope.
Dilts-----	Severe: percs slowly, depth to rock, slope.	Severe: depth to rock, slope.	Severe: too clayey, slope, depth to rock.	Severe: slope.	Poor: too clayey, thin layer, slope.
Rock outcrop.					
81*: Lisam-----	Severe: percs slowly, slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: too clayey, thin layer, slope.
Hillon-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
82*: Lisam-----	Severe: percs slowly, slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: too clayey, thin layer, slope.
Wabek-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope, seepage, small stones.
83----- Lolo	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones, seepage.
84*: Macmeal-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Macmeal-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
85*: Marmarth-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
Cabbart-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
86----- Martinsdale	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
87*: Martinsdale-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Judith-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
88----- Marvan	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
89*: Marvan-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Bascovy-----	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight-----	Poor: too clayey, thin layer, area reclaim.
90, 91----- Nishon	Severe: percs slowly, floods, wetness.	Severe: wetness, floods.	Severe: floods, too clayey, wetness.	Severe: floods, wetness.	Poor: too clayey, wetness.
92----- Norbert	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: too clayey, slope, thin layer.
93*: Norbert-----	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: too clayey, slope, thin layer.
Rock outcrop.					
94*: Perma-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
Castner-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
Belain-----	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, slope, area reclaim.
95, 96----- Phillips	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
97*, 98*: Phillips-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Elloam-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
99*, 100*: Phillips-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
99*, 100*: Kevin-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
101. Pits					
102, 103----- Reeder	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
104: Rubble land. Rock outcrop.					
105----- Savage	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey.
106----- Savage	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
107*: Savage-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Gerdrum-----	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey.	Slight-----	Poor: too clayey.
108----- Scobey	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
109*, 110*: Scobey-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Kevin-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
111----- Shaak	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
112*: Shaak-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Gerdrum-----	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey.	Slight-----	Poor: too clayey.
113, 114----- Shawmut	Moderate: percs slowly.	Moderate: slope, seepage.	Slight-----	Slight-----	Poor: small stones.
115*: Silverchief-----	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: too clayey.
Whitecow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
Macmeal-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
116*: Straw-----	Moderate: floods, percs slowly.	Moderate: seepage.	Moderate: floods.	Moderate: floods.	Good.
Korent-----	Moderate: floods, percs slowly.	Severe: floods, seepage.	Severe: seepage.	Severe: seepage.	Good.
117*: Straw-----	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Korent-----	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
118*: Straw-----	Severe: floods.	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Nesda-----	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones, seepage, area reclaim.
119----- Telstad	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
120*, 121*, 122*: Telstad-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Joplin-----	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
123*: Thoeny-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Elloam-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
124*: Thoeny-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Kevin-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Elloam-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
125----- Turner	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
126*: Turner-----	Slight-----	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones.
Beaverton-----	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones, seepage.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
127*: Twilight-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
Riedel-----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight-----	Poor: thin layer, area reclaim.
128*: Twilight-----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, seepage.	Slight-----	Poor: thin layer, area reclaim.
Riedel-----	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
129. Typic Fluvaquents					
130. Typic Ustifluvents					
131. Ustic Torrifluvents					
132----- Vanda	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey.
133*: Vanda-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey.
Nobe-----	Severe: percs slowly.	Slight-----	Severe: too clayey.	Slight-----	Poor: too clayey.
134*: Vanda-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
Nobe-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey.
135----- Vida	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
136*: Vida-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Zahill-----	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
137----- Wabek	Severe: slope.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
138*: Warneke-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
138*: Whitcow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
Rock outcrop.					
139*: Whitcow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
Warneke-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, small stones.
140*: Whitcow-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
141----- Williams	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
142*, 143*: Williams-----	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Vida-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
144----- Windham	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Moderate: slope.	Poor: slope, small stones.
145, 146----- Work	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
147----- Yamac	Moderate: percs slowly.	Moderate: slope, seepage.	Slight-----	Slight-----	Good.
148*: Yamac-----	Moderate: percs slowly.	Moderate: slope, seepage.	Slight-----	Slight-----	Good.
Benz-----	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
149*: Yamac-----	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Wabek-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
150----- Zahill	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
151*: Zahill-----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Vida-----	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1*: Absher-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, too clayey, excess salt.
Nobe-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium.
2----- Assinniboine	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
3----- Attewan	Fair: frost action, low strength.	Poor: excess fines.	Good-----	Fair: small stones, too clayey.
4*: Attewan-----	Fair: frost action, low strength.	Poor: excess fines.	Good-----	Fair: small stones, too clayey.
Beaverell-----	Good-----	Fair: excess fines.	Fair: excess fines.	Poor: small stones.
5*: Attewan-----	Fair: frost action, low strength.	Poor: excess fines.	Good-----	Fair: small stones, too clayey.
Wabek-----	Good-----	Good-----	Good-----	Poor: small stones.
6. Badland				
7----- Barkof	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
8*, 9*: Barkof-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Norbert-----	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer.
10*: Barkof-----	Poor: low strength, shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope.
Windham-----	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11----- Bascovy	Poor: shrink-swell, low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess fines.
12*: Bascovy-----	Poor: shrink-swell, low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
Lisam-----	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Dilts-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer, area reclaim.
13----- Bearpaw	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
14*, 15*: Bearpaw-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Elloam-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
16*, 17*: Bearpaw-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Vida-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
18----- Belain	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
19----- Benz	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, excess salt.
20----- Bowdoin	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium, excess salt.
21----- Cabba	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
22*: Cabba-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Rock outcrop.				

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
23*: Cabba-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Windham-----	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, slope.
24*: Cabba-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, area reclaim.
Zahill-----	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
25*: Cabbart-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium, thin layer.
Delpoint-----	Fair: low strength, shrink-swell, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Moderate: slope.
26*: Cabbart-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium, thin layer.
Hillon-----	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium.
27*: Cabbart-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium, thin layer.
Rock outcrop.				
28*: Cabbart-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium, thin layer.
Yamac-----	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
29----- Castner	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, large stones, thin layer.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30*: Castner-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, large stones, thin layer.
Perma-----	Poor: slope.	Poor: excess fines, small stones.	Poor: excess fines.	Poor: slope, small stones.
Rock outcrop.				
31----- Chinook	Good-----	Poor: excess fines.	Unsuited: excess fines.	Good.
32----- Chinook	Good-----	Poor: excess fines.	Unsuited: excess fines.	Fair: slope.
33*: Chinook-----	Good-----	Poor: excess fines.	Unsuited: excess fines.	Good.
Phillips-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
34----- Cozberg	Good-----	Poor: excess fines.	Unsuited: excess fines.	Good.
35----- Creed	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
36*: Creed-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Gerdrum-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
37----- Delpoint	Fair: low strength, shrink-swell, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
38*: Delpoint-----	Fair: low strength, shrink-swell, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Cabbart-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, thin layer, area reclaim.
39----- Dimmick	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, too clayey.
40----- Elloam	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
41----- Ethridge	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
42*: Ethridge-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Gerdrum-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
43, 44, 45----- Farnuf	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
46----- Gerdrum	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
47----- Glendive	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
48----- Hanly	Good-----	Poor: excess fines.	Unsuited: excess fines.	Fair: too sandy.
49----- Harlem	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
50----- Harlem	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
51----- Harlem	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt, excess sodium.
52----- Harlem	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
53----- Harlem	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt, excess sodium.
54*: Harlem Variant-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt.
Lardell-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, excess salt.
55----- Havre	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
56----- Havre	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt.
57----- Havre	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
58----- Havre	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt.
59*: Havre-----	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Hanly-----	Good-----	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
59*: Glendive-----	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
60*: Havre Variant-----	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess salt.
Lardell-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, excess salt.
61, 62----- Hedoes	Good-----	Poor: excess fines.	Poor: excess fines.	Fair: small stones.
63*: Hedoes-----	Good-----	Poor: excess fines.	Poor: excess fines.	Fair: slope, small stones.
Belain-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
64*: Hedoes-----	Poor: slope.	Poor: excess fines.	Poor: excess fines.	Poor: slope.
Belain-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
65*: Hedoes-----	Poor: slope.	Poor: excess fines.	Poor: excess fines.	Poor: slope.
Belain-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Castner-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, large stones, thin layer.
66*: Hedoes-----	Good-----	Poor: excess fines.	Poor: excess fines.	Fair: small stones.
Benz-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, excess salt.
67----- Hillon	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium.
68*: Hillon-----	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium.
Kevin-----	Severe: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
69*: Hillon-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
Scobey-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
70*, 71*: Judith-----	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: small stones.
Windham-----	Fair: low strength.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
72----- Kevin	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
73*: Kevin-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Elloam-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
74*: Kevin-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
Hillon-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
75*: Korent-----	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
Nesda-----	Fair: large stones.	Poor: large stones.	Poor: large stones.	Fair: small stones.
76----- Lardell	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, excess salt.
77, 78----- Lihen	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: slope, too sandy.
79*: Lisam-----	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope, thin layer.
Dilts-----	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope, thin layer.
80*: Lisam-----	Poor: low strength, shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope, thin layer.
Dilts-----	Poor: low strength, shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope, thin layer.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
80*: Rock outcrop.				
81*: Lisam-----	Poor: low strength, shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope, thin layer.
Hillon-----	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium.
82*: Lisam-----	Poor: low strength, shrink-swell, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope, thin layer.
Wabek-----	Poor: slope.	Good-----	Good-----	Poor: small stones, slope.
83----- Lolo	Good-----	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
84*: Macmeal-----	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
85*: Marmarth-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
Cabbart-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, thin layer, area reclaim.
86----- Martinsdale	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, too clayey.
87*: Martinsdale-----	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, too clayey.
Judith-----	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: small stones, too clayey.
88----- Marvan	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
89*: Marvan-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Bascovy-----	Poor: shrink-swell, low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
90, 91----- Nishon	Poor: shrink-swell, wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, too clayey.
92----- Norbert	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer, slope.
93*: Norbert-----	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, thin layer, slope.
Rock outcrop.				
94*: Perma-----	Poor: slope.	Poor: excess fines, small stones.	Poor: excess fines.	Poor: slope, small stones.
Castner-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: thin layer.	Poor: slope, large stones, thin layer.
Belain-----	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
95, 96----- Phillips	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
97*, 98*: Phillips-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Elloam-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
99*, 100*: Phillips-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Kevin-----	Severe: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
101. Pits				
102, 103----- Reeder	Poor: low strength, thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
104: Rubble land				
Rock outcrop				

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
105, 106----- Savage	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
107*: Savage-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Gerdrum-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
108----- Scobey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
109*, 110*: Scobey-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Kevin-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
111----- Shaak	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Poor: excess fines.	Poor: too clayey.
112*: Shaak-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Poor: excess fines.	Poor: too clayey.
Gerdrum-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess salt.
113, 114----- Shawmut	Good-----	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
115*: Silverchief-----	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Whitecow-----	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Macmeal-----	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
116*: Straw-----	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Korent-----	Fair: low strength, frost action.	Poor: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
117*: Straw-----	Fair: low strength, frost action.	Poor: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
117*: Korent-----	Fair: low strength, frost action.	Poor: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
118*: Straw-----	Fair: low strength, frost action.	Poor: excess fines.	Unsuited: excess fines.	Good.
Nesda-----	Fair: large stones.	Poor: large stones.	Poor: large stones.	Fair: small stones.
119----- Telstad	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
120*, 121*: Telstad-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Joplin-----	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, small stones.
122*: Telstad-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Joplin-----	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
123*: Thoeny-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium.
Elloam-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
124*: Thoeny-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium.
Kevin-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Elloam-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
125----- Turner	Good-----	Fair: excess fines.	Good-----	Fair: too clayey, small stones.
126*: Turner-----	Good-----	Fair: excess fines.	Good-----	Fair: too clayey, small stones.
Beaverton-----	Good-----	Unsuited: excess fines.	Good-----	Poor: small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
127*: Twilight-----	Poor: thin layer, area reclaim.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
Riedel-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, thin layer, area reclaim.
128*: Twilight-----	Poor: thin layer, area reclaim.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim, thin layer.
Riedel-----	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, thin layer, area reclaim.
129. Typic Fluvaquents				
130. Typic Ustifluvents				
131. Ustic Torrifluvents				
132----- Vanda	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium, excess salt.
133*, 134*: Vanda-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium, excess salt.
Nobe-----	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium.
135----- Vida	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
136*: Vida-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
Zahill-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope.
137----- Wabek	Fair: slope.	Good-----	Good-----	Poor: small stones, slope.
138*: Warneke-----	Poor: slope, area reclaim, thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones, slope, thin layer.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
138*: Whitewcow-----	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Rock outcrop.				
139*: Whitewcow-----	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Warneke-----	Poor: slope, area reclaim, thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones, slope, thin layer.
140*: Whitewcow-----	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones.
141----- Williams	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
142*, 143*: Williams-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Vida-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium.
144----- Windham	Poor: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, slope.
145, 146----- Work	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, excess sodium.
147----- Yamac	Good-----	Unsuited: excess fines.	Unsuited: excess fines.	Good.
148*: Yamac-----	Good-----	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Benz-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess sodium, excess salt.
149*: Yamac-----	Good-----	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Wabek-----	Poor: slope.	Good-----	Good-----	Poor: small stones, slope.
150----- Zahill	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
151*: Zahill-----	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Vida-----	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, excess sodium.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1*: Absher-----	Favorable-----	Piping, excess salt, hard to pack.	Slope, excess sodium, excess salt.	Slope, excess sodium, excess salt.	Percs slowly, erodes easily.	Excess salt, excess sodium, erodes easily.
Nobe-----	Favorable-----	Excess salt, hard to pack, piping.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly, erodes easily.	Erodes easily, excess sodium, excess salt.
2----- Assinniboine	Seepage-----	Piping, seepage.	Slope-----	Slope, soil blowing.	Soil blowing---	Favorable.
3----- Attewan	Seepage-----	Seepage, piping.	Slope-----	Slope, droughty.	Favorable-----	Droughty.
4*: Attewan-----	Seepage-----	Seepage, piping.	Favorable-----	Droughty-----	Favorable-----	Droughty.
Beaverell-----	Seepage-----	Seepage-----	Slope-----	Slope, droughty.	Droughty-----	Droughty.
5*: Attewan-----	Seepage-----	Seepage, piping.	Slope-----	Slope, droughty.	Favorable-----	Droughty.
Wabek-----	Seepage-----	Seepage-----	Favorable-----	Droughty-----	Too sandy-----	Droughty.
6. Badland						
7----- Barkof	Depth to rock--	Thin layer, hard to pack.	Depth to rock, percs slowly.	Too clayey, rooting depth, percs slowly.	Depth to rock, percs slowly.	Rooting depth, percs slowly.
8*: Barkof-----	Depth to rock, slope.	Thin layer, hard to pack.	Slope, depth to rock, percs slowly.	Percs slowly, rooting depth, slope.	Depth to rock, percs slowly.	Slope, percs slowly.
Norbert-----	Depth to rock, slope.	Thin layer-----	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.	Depth to rock, percs slowly.	Slope, erodes easily, rooting depth.
9*: Barkof-----	Depth to rock, slope.	Thin layer, hard to pack.	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.	Depth to rock, percs slowly, slope.	Slope, rooting depth, percs slowly.
Norbert-----	Depth to rock, slope.	Thin layer-----	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.	Slope, depth to rock, percs slowly.	Slope, erodes easily, rooting depth.
10*: Barkof-----	Depth to rock, slope.	Thin layer, hard to pack.	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.	Depth to rock, percs slowly, slope.	Slope, rooting depth, percs slowly.
Windham-----	Slope-----	Seepage-----	Slope-----	Slope, droughty.	Slope-----	Slope, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
11----- Bascovy	Slope-----	Hard to pack, excess salt, thin layer.	Peres slowly, depth to rock, slope.	Peres slowly, slow intake, slope.	Depth to rock, peres slowly.	Excess salt, erodes easily, rooting depth.
12*: Bascovy-----	Slope-----	Hard to pack, excess salt, thin layer.	Peres slowly, depth to rock, slope.	Peres slowly, slow intake, slope.	Depth to rock, peres slowly.	Excess salt, erodes easily, rooting depth.
Lisam-----	Slope, depth to rock.	Thin layer-----	Peres slowly, depth to rock.	Droughty, peres slowly, rooting depth.	Peres slowly, depth to rock, slope.	Droughty, rooting depth.
Dilts-----	Depth to rock	Thin layer-----	Peres slowly, depth to rock.	Peres slowly, rooting depth.	Peres slowly, depth to rock.	Peres slowly, rooting depth.
13----- Bearpaw	Favorable-----	Hard to pack----	Peres slowly, slope.	Slope, peres slowly, erodes easily.	Peres slowly----	Peres slowly, erodes easily.
14*: Bearpaw-----	Favorable-----	Hard to pack----	Peres slowly, slope.	Slope, peres slowly, erodes easily.	Peres slowly----	Peres slowly, erodes easily.
Elloam-----	Favorable-----	Piping, hard to pack.	Slope, peres slowly, excess sodium.	Slope, peres slowly, excess sodium.	Peres slowly----	Excess sodium, peres slowly.
15*: Bearpaw-----	Slope-----	Hard to pack----	Peres slowly, slope.	Slope, peres slowly, erodes easily.	Peres slowly----	Slope, peres slowly, erodes easily.
Elloam-----	Slope-----	Piping, hard to pack.	Slope, peres slowly, excess sodium.	Slope, peres slowly, excess sodium.	Peres slowly----	Slope, excess sodium, peres slowly.
16*: Bearpaw-----	Favorable-----	Hard to pack----	Peres slowly, slope.	Slope, peres slowly, erodes easily.	Peres slowly----	Peres slowly, erodes easily.
Vida-----	Favorable-----	Piping-----	Slope, peres slowly.	Peres slowly, slope.	Peres slowly----	Peres slowly.
17*: Bearpaw-----	Slope-----	Hard to pack----	Peres slowly, slope.	Slope, slow intake, erodes easily.	Peres slowly----	Slope, peres slowly, erodes easily.
Vida-----	Slope-----	Piping-----	Slope, peres slowly.	Peres slowly, slope.	Peres slowly----	Slope, peres slowly, excess sodium.
18----- Belain	Slope, seepage, depth to rock.	Thin layer-----	Slope, depth to rock, frost action.	Slope, erodes easily, rooting depth.	Depth to rock	Slope, erodes easily, rooting depth.
19----- Benz	Favorable-----	Piping-----	Peres slowly, excess sodium, slope.	Excess sodium, peres slowly, slope.	Peres slowly----	Peres slowly, excess sodium, excess salt.
20----- Bowdoin	Favorable-----	Piping, excess salt, hard to pack.	Peres slowly, excess sodium, floods.	Slow intake, excess sodium, peres slowly.	Peres slowly----	Excess sodium, peres slowly, excess salt.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
21----- Cabba	Slope, seepage, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Rooting depth, slope, erodes easily.
22*: Cabba----- Rock outcrop.	Slope, seepage, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Rooting depth, slope, erodes easily.
23*: Cabba-----	Slope, seepage, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Rooting depth, slope, erodes easily.
Windham-----	Slope-----	Piping-----	Slope-----	Slope, droughty.	Slope, droughty.	Slope, droughty.
24*: Cabba-----	Slope, seepage, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Rooting depth, slope, erodes easily.
Zahill-----	Slope-----	Favorable-----	Slope-----	Slope, erodes easily.	Slope-----	Slope, erodes easily.
25*: Cabbart-----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, rooting depth, erodes easily.
Delpoint-----	Slope-----	Piping, low strength.	Slope, depth to rock.	Rooting depth, slope, erodes easily.	Slope, depth to rock.	Slope, erodes easily.
26*: Cabbart-----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth, erodes easily.
Hillon-----	Slope-----	Piping-----	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
27*: Cabbart----- Rock outcrop.	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, rooting depth, erodes easily.
28*: Cabbart-----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth, erodes easily.
Yamac----- Rock outcrop.	Slope, seepage.	Piping-----	Slope-----	Slope, erodes easily.	Slope-----	Slope, erodes easily.
29----- Castner	Slope, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock, large stones.	Large stones, slope, rooting depth.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
30*: Castner-----	Slope, depth to rock.	Thin layer----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock, large stones.	Large stones, slope, rooting depth.
Perma-----	Slope, seepage.	Seepage, large stones.	Slope-----	Slope, large stones.	Slope, droughty.	Slope, droughty, large stones.
Rock outcrop.						
31----- Chinook	Seepage, slope.	Seepage-----	Slope-----	Seepage, soil blowing, slope.	Soil blowing---	Slope.
32----- Chinook	Seepage, slope.	Seepage-----	Slope-----	Seepage, soil blowing, slope.	Soil blowing, slope.	Slope.
33*: Chinook-----	Seepage, slope.	Seepage-----	Slope-----	Seepage, soil blowing, slope.	Soil blowing---	Slope.
Phillips-----	Slope-----	Hard to pack---	Slope, percs slowly.	Percs slowly, slope.	Percs slowly, erodes easily.	Slope, erodes easily, percs slowly.
34----- Cozberg	Seepage-----	Seepage, piping.	Slope-----	Slope, droughty, soil blowing.	Soil blowing---	Droughty.
35----- Creed	Favorable-----	Hard to pack, excess salt.	Percs slowly, slope.	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
36*: Creed-----	Favorable-----	Hard to pack, excess salt.	Percs slowly, slope.	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Gerdrum-----	Favorable-----	Excess salt----	Slope, percs slowly, excess salt.	Slope, percs slowly.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
37----- Delpoint	Depth to rock--	Thin layer----	Slope, depth to rock.	Rooting depth, slope, erodes easily.	Depth to rock--	Erodes easily.
38*: Delpoint-----	Slope-----	Thin layer----	Slope, depth to rock.	Rooting depth, slope, erodes easily.	Depth to rock--	Slope, erodes easily.
Cabbart-----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth.	Depth to rock	Slope, rooting depth, erodes easily.
39----- Dimmick	Favorable-----	Wetness, hard to pack.	Floods, percs slowly.	Wetness, slow intake, percs slowly.	Percs slowly---	Wetness, percs slowly.
40----- Elloam	Favorable-----	Piping, hard to pack, excess salt.	Slope, percs slowly, excess salt.	Slope, percs slowly, excess salt.	Percs slowly---	Excess sodium, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
41----- Ethridge	Favorable-----	Hard to pack, piping.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly---	Percs slowly, erodes easily.
42*: Ethridge-----	Favorable-----	Hard to pack, piping.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly---	Percs slowly, erodes easily.
Gerdrum-----	Favorable-----	Piping, excess salt.	Slope, percs slowly, excess salt.	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
43----- Farnuf	Seepage-----	Piping-----	Favorable-----	Favorable-----	Favorable-----	Favorable.
44----- Farnuf	Seepage-----	Piping-----	Slope-----	Slope-----	Favorable-----	Favorable.
45----- Farnuf	Slope, seepage.	Piping-----	Slope-----	Slope-----	Favorable-----	Slope.
46----- Gerdrum	Favorable-----	Piping, excess salt.	Slope, percs slowly, excess salt.	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
47----- Glendive	Seepage-----	Piping-----	Favorable-----	Soil blowing---	Soil blowing---	Favorable.
48----- Hanly	Seepage-----	Seepage, piping.	Floods-----	Droughty, floods, soil blowing.	Droughty-----	Droughty.
49, 50----- Harlem	Favorable-----	Favorable-----	Percs slowly---	Percs slowly---	Percs slowly, poor outlets.	Percs slowly.
51----- Harlem	Favorable-----	Excess salt, piping.	Wetness, percs slowly.	Wetness, percs slowly, excess sodium.	Percs slowly---	Excess salt, excess sodium, percs slowly.
52----- Harlem	Favorable-----	Piping-----	Percs slowly---	Percs slowly, slow intake.	Percs slowly, poor outlets.	Percs slowly.
53----- Harlem	Favorable-----	Excess salt, piping.	Wetness, percs slowly.	Slow intake, percs slowly, excess sodium.	Percs slowly---	Excess salt, excess sodium, percs slowly.
54*: Harlem Variant---	Favorable-----	Excess salt,, piping.	Percs slowly, excess sodium.	Percs slowly, excess sodium.	Percs slowly, wetness.	Percs slowly, excess sodium.
Lardell-----	Favorable-----	Piping, excess salt.	Percs slowly, excess salt, excess sodium.	Percs slowly, wetness, excess sodium.	Wetness, percs slowly, droughty.	Excess salt, wetness, excess sodium.
55, 57----- Havre	Seepage-----	Piping-----	Favorable-----	Erodes easily---	Favorable-----	Erodes easily.
56, 58----- Havre	Seepage-----	Piping-----	Excess salt, wetness.	Excess salt, wetness, erodes easily.	Favorable-----	Excess salt.
59*: Havre-----	Seepage-----	Piping-----	Floods-----	Floods-----	Favorable-----	Favorable.
Hanly-----	Seepage-----	Seepage, piping.	Not needed-----	Droughty, floods, soil blowing.	Not needed-----	Not needed.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
59*: Glendive-----	Seepage-----	Piping-----	Floods-----	Floods, soil blowing.	Soil blowing---	Favorable.
60*: Havre Variant----	Seepage-----	Piping-----	Excess sodium, wetness.	Excess sodium, wetness.	Wetness-----	Excess sodium, wetness.
Lardell-----	Favorable-----	Piping, excess salt.	Peres slowly, excess salt, excess sodium.	Peres slowly, wetness, excess sodium.	Wetness, peres slowly, droughty.	Excess salt, wetness, excess sodium.
61----- Hedoes	Seepage-----	Seepage, piping.	Slope-----	Slope, droughty.	Favorable-----	Droughty.
62----- Hedoes	Slope, seepage.	Seepage, piping.	Slope-----	Slope, droughty.	Favorable-----	Slope, droughty.
63*, 64*: Hedoes-----	Slope, seepage.	Seepage, piping.	Slope-----	Slope, droughty.	Slope-----	Slope, droughty.
Belain-----	Slope, seepage, depth to rock.	Thin layer, seepage.	Slope, depth to rock, frost action.	Slope, erodes easily, rooting depth.	Slope, depth to rock.	Slope, erodes easily, rooting depth.
65*: Hedoes-----	Slope, seepage.	Seepage, piping.	Slope-----	Slope, droughty.	Slope-----	Slope, droughty.
Belain-----	Slope, seepage, depth to rock.	Thin layer, seepage.	Slope, depth to rock, frost action.	Slope, erodes easily, rooting depth.	Slope, depth to rock.	Slope, erodes easily, rooting depth.
Castner-----	Slope, depth to rock.	Thin layer----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock, large stones.	Large stones, slope, rooting depth.
66*: Hedoes-----	Seepage-----	Seepage, piping.	Slope-----	Slope, droughty.	Favorable-----	Droughty.
Benz-----	Favorable-----	Piping-----	Peres slowly, excess sodium, slope.	Excess sodium, peres slowly, slope.	Peres slowly---	Peres slowly, excess sodium, excess salt.
67----- Hillon	Slope-----	Piping-----	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.
68*: Hillon-----	Slope-----	Piping-----	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.
Kevin-----	Slope-----	Piping-----	Complex slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.
69*: Hillon-----	Slope-----	Piping-----	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.	Slope, peres slowly.
Scobey-----	Slope-----	Piping-----	Complex slope, peres slowly.	Complex slope, peres slowly.	Peres slowly---	Slope, peres slowly.
70*: Judith-----	Slope, seepage.	Piping, seepage.	Slope-----	Slope-----	Favorable-----	Slope.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
70*: Windham-----	Slope, seepage.	Piping, seepage.	Slope-----	Slope, droughty.	Favorable-----	Slope, droughty.
71*: Judith-----	Slope, seepage.	Piping, seepage.	Slope-----	Slope-----	Slope-----	Slope.
Windham-----	Slope, seepage.	Piping, seepage.	Slope-----	Slope, droughty.	Slope-----	Slope, droughty.
72----- Kevin	Slope-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly---	Slope, percs slowly.
73*: Kevin-----	Slope-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly---	Slope, percs slowly.
Elloam-----	Slope-----	Piping, excess sodium.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly---	Slope, excess sodium.
74*: Kevin-----	Slope-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
Hillon-----	Slope-----	Piping-----	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
75*: Korent-----	Seepage-----	Favorable-----	Floods-----	Erodes easily, floods.	Favorable-----	Erodes easily.
Nesda-----	Seepage-----	Seepage-----	Floods-----	Floods, droughty.	Large stones, too sandy.	Droughty, large stones.
76----- Lardell	Favorable-----	Piping, excess salt, excess sodium.	Percs slowly, excess salt, excess sodium.	Percs slowly, wetness, excess sodium.	Wetness, percs slowly, droughty.	Excess salt, wetness, excess sodium.
77----- Lihen	Seepage-----	Piping, seepage.	Slope-----	Slope, droughty, soil blowing.	Too sandy, droughty.	Droughty.
78----- Lihen	Seepage, slope.	Piping, seepage.	Slope-----	Slope, droughty, soil blowing.	Too sandy, soil blowing, slope.	Slope, droughty.
79*: Lisam-----	Slope, depth to rock.	Thin layer----	Depth to rock--	Slope, droughty, rooting depth.	Percs slowly, depth to rock, slope.	Droughty, percs slowly.
Dilts-----	Depth to rock	Thin layer----	Depth to rock--	Slope, droughty, rooting depth.	Percs slowly, depth to rock.	Percs slowly, rooting depth.
80*: Lisam-----	Slope, depth to rock.	Thin layer----	Depth to rock--	Slope, droughty, rooting depth.	Percs slowly, depth to rock, slope.	Droughty, percs slowly.
Dilts-----	Depth to rock	Thin layer----	Depth to rock--	Slope, droughty, rooting depth.	Percs slowly, depth to rock.	Percs slowly, rooting depth.
Rock outcrop.						

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
81*: Lisam-----	Slope, depth to rock.	Thin layer----	Depth to rock--	Slope, droughty, rooting depth.	Percs slowly, depth to rock, slope.	Droughty, percs slowly.
Hillon-----	Slope-----	Piping-----	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
82*: Lisam-----	Slope, depth to rock.	Thin layer----	Depth to rock--	Slope, droughty, rooting depth.	Percs slowly, depth to rock, slope.	Droughty, percs slowly.
Wabek-----	Slope, seepage.	Seepage-----	Not needed-----	Droughty, slope.	Slope, too sandy.	Slope, droughty.
83----- Lolo	Seepage-----	Piping-----	Slope-----	Slope, fast intake, droughty.	Small stones---	Droughty.
84*: Macmeal-----	Slope-----	Favorable-----	Slope-----	Slope, droughty.	Slope, large stones.	Slope, droughty.
85*: Marmarth-----	Seepage, depth to rock.	Low strength, piping.	Not needed-----	Rooting depth	Depth to rock, rooting depth.	Rooting depth, slope.
Cabbart-----	Slope, depth to rock.	Piping, thin layer.	Slope, depth to rock.	Slope, rooting depth, erodes easily.	Depth to rock	Slope, rooting depth, erodes easily.
86----- Martinsdale	Favorable-----	Piping-----	Slope-----	Slope, erodes easily.	Favorable-----	Erodes easily.
87*: Martinsdale-----	Slope-----	Piping-----	Slope-----	Slope, erodes easily.	Favorable-----	Slope, erodes easily.
Judith-----	Slope, seepage.	Piping, seepage.	Slope, cutbanks cave.	Slope-----	Favorable-----	Slope, droughty.
88----- Marvan	Favorable-----	Piping, hard to pack.	Slope, percs slowly, excess sodium.	Slope, percs slowly, slow intake.	Percs slowly---	Percs slowly, excess sodium, erodes easily.
89*: Marvan-----	Slope-----	Piping, hard to pack.	Slope, percs slowly, excess sodium.	Slope, percs slowly, slow intake.	Percs slowly---	Slope, percs slowly, excess sodium.
Bascovy-----	Slope-----	Hard to pack, excess salt, thin layer.	Percs slowly, depth to rock, slope.	Percs slowly, slow intake, slope.	Depth to rock, percs slowly.	Excess salt, erodes easily, slope.
90, 91----- Nishon	Favorable-----	Hard to pack, wetness, piping.	Percs slowly, floods, excess sodium.	Percs slowly, slow intake, wetness.	Percs slowly, wetness.	Percs slowly, wetness, excess sodium.
92----- Norbert	Depth to rock, slope.	Thin layer----	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.	Slope, depth to rock, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
93*: Norbert----- Rock outcrop.	Depth to rock, slope.	Thin layer----	Slope, depth to rock, percs slowly.	Slope, percs slowly, rooting depth.	Slope, depth to rock, percs slowly.	Slope, erodes easily, rooting depth.
94*: Perma----- Castner-----	Slope, seepage.	Seepage, large stones.	Slope, frost action.	Slope, droughty.	Slope, small stones.	Slope, droughty.
Belain-----	Slope, depth to rock.	Thin layer----	Slope, depth to rock, frost action.	Slope, droughty, rooting depth.	Slope, depth to rock, large stones.	Large stones, slope, rooting depth.
95----- Phillips	Slope, seepage, depth to rock.	Thin layer----	Slope, depth to rock, frost action.	Slope, erodes easily, rooting depth.	Slope, depth to rock.	Slope, erodes easily, rooting depth.
96----- Phillips	Favorable-----	Hard to pack----	Slope, percs slowly.	Percs slowly, slow intake, slope.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
97*: Phillips-----	Slope-----	Hard to pack----	Slope, percs slowly.	Percs slowly, slow intake, slope.	Percs slowly, erodes easily.	Slope, erodes easily, percs slowly.
Elloam-----	Favorable-----	Hard to pack----	Slope, percs slowly.	Percs slowly, slow intake, slope.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
98*: Phillips-----	Favorable-----	Piping, hard to pack.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly----	Excess sodium.
Elloam-----	Slope-----	Hard to pack----	Slope, percs slowly.	Percs slowly, slow intake, slope.	Percs slowly, erodes easily.	Slope, erodes easily, percs slowly.
99*: Phillips-----	Slope-----	Piping, hard to pack.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly----	Slope, excess sodium.
Kevin-----	Favorable-----	Hard to pack----	Slope, percs slowly.	Percs slowly, slow intake, slope.	Percs slowly, erodes easily.	Erodes easily, percs slowly.
100*: Phillips-----	Favorable-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly----	Percs slowly.
Kevin-----	Slope-----	Hard to pack----	Slope, percs slowly.	Percs slowly, slow intake, slope.	Percs slowly, erodes easily.	Slope, erodes easily, percs slowly.
101. Pits	Slope-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly----	Slope, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
102----- Reeder	Seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth	Depth to rock	Rooting depth.
103----- Reeder	Slope, seepage, depth to rock.	Thin layer-----	Not needed-----	Rooting depth, slope.	Depth to rock	Rooting depth.
104: Rubble land. Rock outcrop.						
105----- Savage	Favorable-----	Hard to pack---	Frost action---	Slow intake, erodes easily.	Favorable-----	Favorable.
106----- Savage	Favorable-----	Hard to pack---	Frost action, slope.	Slow intake, slope, erodes easily.	Favorable-----	Favorable.
107*: Savage-----	Favorable-----	Hard to pack---	Frost action, slope.	Slow intake, slope, erodes easily.	Favorable-----	Favorable.
Gerdrum-----	Favorable-----	Piping, excess salt.	Slope, percs slowly, excess salt.	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
108----- Scobey	Favorable-----	Low strength, shrink-swell, hard to pack.	Complex slope, percs slowly.	Complex slope, percs slowly.	Percs slowly---	Percs slowly.
109*: Scobey-----	Favorable-----	Low strength, shrink-swell, hard to pack.	Complex slope, percs slowly.	Complex slope, percs slowly.	Percs slowly---	Percs slowly.
Kevin-----	Favorable-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly---	Percs slowly.
110*: Scobey-----	Slope-----	Low strength, shrink-swell, hard to pack.	Complex slope, percs slowly.	Complex slope, percs slowly.	Percs slowly---	Slope, percs slowly.
Kevin-----	Slope-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly---	Slope, percs slowly.
111----- Shaak	Favorable-----	Hard to pack---	Slope, percs slowly, excess salt.	Slow intake, percs slowly, slope.	Percs slowly, small stones, erodes easily.	Erodes easily, percs slowly.
112*: Shaak-----	Favorable-----	Hard to pack---	Slope, percs slowly, excess salt.	Slow intake, percs slowly, slope.	Percs slowly, small stones, erodes easily.	Erodes easily, percs slowly.
Gerdrum-----	Favorable-----	Piping, excess salt.	Slope, percs slowly, excess salt.	Slope, slow intake, percs slowly.	Erodes easily, percs slowly.	Excess salt, excess sodium, erodes easily.
113----- Shawmut	Seepage-----	Favorable-----	Slope-----	Slope, droughty.	Favorable-----	Droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
114----- Shawmut	Slope, seepage.	Favorable-----	Slope-----	Slope, droughty.	Favorable-----	Slope, droughty.
115*: Silverchief-----	Slope-----	Hard to pack, low strength.	Slope-----	Slope, slow intake.	Slope-----	Slope.
Whitecow-----	Slope-----	Seepage-----	Slope-----	Slope-----	Slope, large stones.	Slope, large stones.
Macmeal-----	Slope-----	Favorable-----	Slope-----	Slope, droughty.	Slope, large stones.	Slope, droughty.
116*: Straw-----	Seepage-----	Low strength, hard to pack, piping.	Favorable-----	Erodes easily--	Slope, piping, erodes easily.	Slope, erodes easily.
Korent-----	Seepage-----	Piping-----	Frost action--	Erodes easily--	Favorable-----	Erodes easily.
117*: Straw-----	Seepage-----	Piping-----	Floods-----	Floods-----	Favorable-----	Erodes easily.
Korent-----	Seepage-----	Seepage, wetness, piping.	Floods-----	Erodes easily, floods.	Wetness, soil blowing.	Erodes easily.
118*: Straw-----	Seepage-----	Piping-----	Floods-----	Floods-----	Favorable-----	Erodes easily.
Nesda-----	Seepage-----	Seepage-----	Floods-----	Floods, droughty.	Large stones, small stones, too sandy.	Droughty.
119----- Telstad	Favorable-----	Low strength--	Slope, percs slowly.	Percs slowly, erodes easily.	Percs slowly--	Percs slowly, erodes easily.
120*, 122*: Telstad-----	Favorable-----	Low strength--	Slope, percs slowly.	Percs slowly, erodes easily.	Percs slowly--	Percs slowly, erodes easily.
Joplin-----	Favorable-----	Favorable-----	Percs slowly--	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
121*: Telstad-----	Slope-----	Low strength--	Slope, percs slowly.	Percs slowly, erodes easily.	Percs slowly, erodes easily.	Slope, percs slowly, erodes easily.
Joplin-----	Slope-----	Favorable-----	Percs slowly, slope.	Percs slowly, slope, erodes easily.	Percs slowly, erodes easily.	Percs slowly, slope, erodes easily.
123*: Thoeny-----	Favorable-----	Hard to pack, low strength.	Slope, percs slowly, excess sodium.	Slope, slow intake, excess sodium.	Percs slowly--	Erodes easily, excess sodium, percs slowly.
Elloam-----	Favorable-----	Piping, hard to pack.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly--	Excess sodium.
124*: Thoeny-----	Slope-----	Hard to pack, low strength.	Slope, percs slowly, excess sodium.	Slope, slow intake, excess sodium.	Percs slowly--	Slope, erodes easily, excess sodium.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
124*: Kevin-----	Slope-----	Piping-----	Complex slope, percs slowly.	Slope, percs slowly.	Percs slowly---	Slope, percs slowly.
Elloam-----	Slope-----	Piping, hard to pack.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly---	Slope, excess sodium.
125----- Turner	Seepage-----	Seepage-----	Slope-----	Slope, droughty, erodes easily.	Too sandy-----	Droughty, erodes easily.
126*: Turner-----	Slope, seepage.	Seepage-----	Slope-----	Slope, droughty, erodes easily.	Too sandy-----	Slope, droughty, erodes easily.
Beaverton-----	Slope, seepage.	Seepage-----	Slope, cutbanks cave.	Slope, droughty.	Small stones---	Slope, droughty, erodes easily.
127*: Twilight-----	Slope, seepage, depth to rock.	Seepage, thin layer.	Not needed----	Slope, soil blowing, rooting depth.	Soil blowing, depth to rock.	Rooting depth.
Riedel-----	Depth to rock, seepage, slope.	Thin layer----	Not needed----	Slope, soil blowing, rooting depth.	Depth to rock, soil blowing.	Slope, rooting depth.
128*: Twilight-----	Slope, seepage, depth to rock.	Seepage, thin layer.	Not needed----	Slope, soil blowing, rooting depth.	Slope, soil blowing, depth to rock.	Slope, rooting depth.
Riedel-----	Depth to rock, seepage, slope.	Thin layer----	Not needed----	Slope, soil blowing, rooting depth.	Depth to rock, slope, soil blowing.	Slope, rooting depth.
129. Typic Fluvaquents						
130. Typic Ustifluents						
131. Ustic Torrifluents						
132----- Vanda	Favorable-----	Piping, hard to pack.	Percs slowly, excess salt, excess sodium.	Percs slowly, excess salt, excess sodium.	Percs slowly---	Excess sodium, percs slowly, excess salt.
133*: Vanda-----	Favorable-----	Piping, hard to pack.	Percs slowly, excess salt, excess sodium.	Percs slowly, excess salt, excess sodium.	Percs slowly---	Excess sodium, percs slowly, excess salt.
Nobe-----	Favorable-----	Excess salt, hard to pack, piping.	Percs slowly, excess sodium.	Percs slowly, excess sodium, excess salt.	Percs slowly, erodes easily.	Erodes easily, excess sodium, excess salt.
134*: Vanda-----	Slope-----	Piping, hard to pack.	Percs slowly, excess sodium, slope.	Percs slowly, excess sodium, slope.	Percs slowly---	Slope, excess sodium, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
134*: Nobe-----	Slope-----	Excess salt, hard to pack, piping.	Slope, percs slowly, excess sodium.	Slope, percs slowly, excess sodium.	Percs slowly, erodes easily.	Slope, erodes easily, excess sodium.
135----- Vida	Slope-----	Piping-----	Slope, percs slowly.	Percs slowly, slope.	Percs slowly---	Slope, percs slowly.
136*: Vida-----	Slope-----	Piping-----	Slope, percs slowly.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Zahill-----	Slope-----	Favorable-----	Slope-----	Slope, erodes easily.	Slope-----	Slope, erodes easily.
137----- Wabek	Slope, seepage.	Seepage-----	Not needed-----	Droughty, slope.	Slope, too sandy.	Slope, droughty.
138*: Warneke-----	Slope, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth, droughty.
Whitecow-----	Slope-----	Seepage-----	Slope-----	Slope-----	Slope, large stones.	Slope, large stones.
Rock outcrop.						
139*: Whitecow-----	Slope-----	Seepage-----	Slope-----	Slope-----	Slope, large stones.	Slope, large stones.
Warneke-----	Slope, depth to rock.	Thin layer-----	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting depth, droughty.
140*: Whitecow-----	Slope-----	Seepage-----	Slope-----	Slope-----	Slope, large stones.	Slope, large stones.
141----- Williams	Favorable-----	Favorable-----	Not needed-----	Favorable-----	Favorable-----	Favorable.
142*: Williams-----	Favorable-----	Favorable-----	Not needed-----	Favorable-----	Favorable-----	Favorable.
Vida-----	Favorable-----	Piping-----	Slope, percs slowly.	Percs slowly, slope.	Percs slowly---	Percs slowly.
143*: Williams-----	Slope-----	Favorable-----	Not needed-----	Slope-----	Favorable-----	Erodes easily.
Vida-----	Slope-----	Piping-----	Slope, percs slowly.	Percs slowly, slope.	Percs slowly---	Slope, percs slowly.
144----- Windham	Slope-----	Piping-----	Slope-----	Slope, droughty.	Slope-----	Slope, droughty.
145----- Work	Seepage-----	Hard to pack---	Slope-----	Slope, erodes easily.	Favorable-----	Favorable.
146----- Work	Slope, seepage.	Hard to pack---	Slope-----	Slope, erodes easily.	Favorable-----	Slope, erodes easily.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
147----- Yamac	Seepage-----	Piping-----	Slope-----	Slope, erodes easily.	Favorable-----	Erodes easily.
148*: Yamac-----	Seepage-----	Piping-----	Slope-----	Slope, erodes easily.	Favorable-----	Erodes easily.
Benz-----	Favorable-----	Piping-----	Percs slowly, excess sodium, slope.	Excess sodium, percs slowly, slope.	Percs slowly---	Percs slowly, excess sodium, excess salt.
149*: Yamac-----	Slope, seepage.	Piping-----	Slope-----	Slope, erodes easily.	Slope-----	Slope, erodes easily.
Wabek-----	Slope, seepage.	Seepage-----	Not needed----	Droughty, slope.	Slope, too sandy.	Slope, droughty.
150----- Zahill	Slope-----	Favorable-----	Slope-----	Slope, erodes easily.	Slope-----	Slope, erodes easily.
151*: Zahill-----	Slope-----	Favorable-----	Slope-----	Slope, erodes easily.	Slope-----	Slope, erodes easily.
Vida-----	Slope-----	Piping-----	Slope, percs slowly.	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1*: Absher-----	0-7	Clay loam-----	CL	A-6, A-7	0	95-100	75-100	70-100	55-95	35-45	15-25
	7-20	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	75-100	70-100	60-95	40-60	20-40
	20-60	Clay loam, clay, silty clay.	CL, CH	A-7	0	95-100	75-100	70-100	60-95	40-60	20-40
Nobe-----	0-7	Clay-----	CL, CH	A-7	0	100	100	90-100	80-95	45-55	25-35
	7-60	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-35
2-----	0-9	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	20-30	NP-5
Assinniboine	9-21	Sandy clay loam	SC, CL	A-6	0	100	100	80-90	35-55	25-35	10-15
	21-60	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	20-30	NP-5
3-----	0-6	Loam-----	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-95	60-75	25-35	5-15
Attewan	6-20	Clay loam, sandy clay loam.	CL	A-6	0-5	85-100	85-100	85-95	70-80	30-40	10-15
	20-25	Loam, gravelly loam, clay loam.	ML, SM	A-4	0-10	60-100	50-85	45-90	35-70	25-35	NP-10
	25-60	Very gravelly sand, very gravelly loamy sand.	GP, GP-GM	A-1	0-25	15-65	5-50	5-20	0-15	---	NP
4*: Attewan-----	0-6	Loam-----	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-95	60-75	25-35	5-15
	6-20	Clay loam, sandy clay loam.	CL	A-6	0-5	85-100	85-100	85-95	70-80	30-40	10-15
	20-25	Loam, gravelly loam, clay loam.	ML, SM	A-4	0-10	60-100	50-85	45-90	35-70	25-35	NP-10
	25-60	Very gravelly sand, very gravelly loamy sand.	GP, GP-GM	A-1	0-25	15-65	5-50	5-20	0-15	---	NP
Beaverell-----	0-3	Gravelly loam---	GM, GM-GC, SM, SM-SC	A-2, A-4	0-15	55-75	50-65	40-60	25-50	20-30	NP-10
	3-11	Gravelly clay loam, gravelly sandy clay loam, gravelly loam.	GC	A-6, A-2	0-15	55-75	50-65	40-60	20-50	25-35	10-15
	11-17	Gravelly sandy loam, very gravelly sandy loam.	GM	A-1	0-15	35-55	25-55	15-35	10-20	---	NP
	17-60	Stratified very gravelly sand to loamy sand.	GM, GP-GM, GP	A-1	0-15	30-60	20-50	10-35	0-15	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
5*: Attewan-----	0-6	Loam-----	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-90	60-75	25-35	5-15
	6-20	Clay loam, sandy clay loam.	CL	A-6	0-5	85-100	85-100	85-95	70-80	30-40	10-15
	20-25	Loam, gravelly loam, clay loam.	ML, SM	A-4	0-10	60-100	50-85	45-90	35-70	25-35	NP-10
	25-60	Very gravelly sand, very gravelly loamy sand.	GP, GP-GM	A-1	0-25	15-65	5-50	5-20	0-15	---	NP
Wabek-----	0-8	Gravelly loam---	SM	A-4	0	70-80	60-70	40-50	35-45	25-40	NP-10
	8-60	Very gravelly coarse sand, very gravelly loamy coarse sand.	SP GP	A-1	0	40-60	35-50	10-40	0-5	---	NP
6. Badland											
7----- Barkof	0-7	Clay-----	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	7-28	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
8*: Barkof-----	0-7	Clay-----	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	7-28	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Norbert-----	0-7	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	7-14	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
9*: Barkof-----	0-7	Clay-----	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	7-28	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	28	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Norbert-----	0-7	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	7-14	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10*: Barkof-----	0-7	Clay-----	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	7-28	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	75-90	45-60	20-30
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Windham-----	0-6	Gravelly loam---	ML, SM	A-4	0-15	70-95	60-75	50-80	35-65	25-35	NP-10
	6-60	Very gravelly clay loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6	0-15	35-70	25-60	20-55	15-50	25-35	5-15
11----- Bascovy	0-6	Clay-----	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	6-10	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	10-15	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	15-23	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
12*: Bascovy-----	0-6	Clay-----	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	6-10	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	10-15	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	15-23	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Lisam-----	0-17	Clay-----	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Dilts-----	0-16	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-75	25-50
	16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
13----- Bearpaw	0-6	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
	6-23	Clay loam, clay	CL, CH	A-7	0-5	95-100	95-100	90-100	70-85	45-55	20-30
	23-39	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
	39-60	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
14*, 15*: Bearpaw-----	0-6	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
	6-23	Clay loam, clay	CL, CH	A-7	0-5	95-100	95-100	90-100	70-85	45-55	20-30
	23-39	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
	39-60	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
Elloam-----	0-3	Clay loam-----	CL	A-6	0-5	95-100	75-100	70-100	55-80	30-40	10-15
	3-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	75-100	70-100	55-95	35-45	15-25
	17-28	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	75-100	65-100	45-80	30-45	10-20
	28-62	Clay loam, loam	CL, SM, SC, ML	A-7	0-5	95-100	75-100	65-100	45-80	40-50	15-20
16*, 17*: Bearpaw-----	0-6	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
	6-23	Clay loam, clay	CL, CH	A-7	0-5	95-100	95-100	90-100	70-85	45-55	20-30
	23-39	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
	39-60	Clay loam-----	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-80	25-45	10-20
Vida-----	0-4	Clay loam-----	CL	A-4, A-6	0-15	90-100	90-100	85-95	70-80	20-40	10-20
	4-34	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
	34-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
18----- Belain	0-4	Loam-----	ML, CL-ML	A-4	0-5	95-100	85-100	85-95	60-75	20-30	NP-10
	4-11	Sandy loam, loam	ML, SM	A-4	0-5	95-100	85-95	65-90	35-70	25-35	NP-5
	11-22	Gravelly sandy loam, gravelly loam.	ML, SM, GM	A-2, A-4	0-5	60-85	50-75	35-70	20-55	25-35	NP-5
	22-28	Very gravelly loam, very gravelly sandy loam.	GM	A-1, A-2	0-5	35-60	25-50	15-45	10-35	25-35	NP-5
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
19----- Benz	0-13	Loam-----	ML	A-4	0	100	100	85-100	60-90	25-40	NP-10
	13-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	65-80	25-40	5-20
20----- Bowdoin	0-6	Clay-----	CH	A-7	0	100	100	90-100	80-95	60-85	30-55
	6-60	Clay-----	CH	A-7	0	100	100	90-100	80-95	60-85	30-55
21----- Cabba	0-12	Loam-----	CL, SC	A-6	0	100	100	95-100	45-90	25-35	10-15
	12	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
22*: Cabba-----	0-12 12	Loam----- Weathered bedrock.	CL, SC ---	A-6 ---	0 ---	100 ---	100 ---	95-100 ---	45-90 ---	25-35 ---	10-15 ---
Rock outcrop.											
23*: Cabba-----	0-12 12	Loam----- Weathered bedrock.	CL, SC ---	A-6 ---	0 ---	100 ---	100 ---	95-100 ---	45-90 ---	25-35 ---	10-15 ---
Windham-----	0-6 6-60	Gravelly loam--- Very gravelly clay loam, very gravelly loam.	ML, SM GM-GC, GC	A-4 A-2, A-4, A-6	0-15 0-15	70-95 35-70	60-75 25-60	50-80 20-55	35-65 15-50	25-35 25-35	NP-10 5-15
24*: Cabba-----	0-12 12	Loam----- Weathered bedrock.	CL, SC ---	A-6 ---	0 ---	100 ---	100 ---	95-100 ---	45-90 ---	25-35 ---	10-15 ---
Zahill-----	0-3 3-60	Clay loam----- Clay loam, loam	CL CL, CL-ML	A-6 A-4, A-6	0-10 0-10	90-100 90-100	90-100 90-100	85-95 85-95	70-80 70-80	20-40 25-40	10-20 5-20
25*: Cabbart-----	0-4 4-12 12	Loam----- Loam, clay loam, silty clay loam. Weathered bedrock.	CL-ML CL ---	A-4 A-6 ---	0 0 ---	100 100 ---	100 100 ---	85-95 85-100 ---	60-75 65-95 ---	20-30 30-40 ---	5-10 10-15 ---
Delpoint-----	0-4 4-16 16-32 32	Loam----- Loam, clay loam, silty clay loam. Loam, clay loam, silty clay loam. Weathered bedrock.	ML, CL-ML CL, CL-ML CL, CL-ML ---	A-4 A-4, A-6 A-4, A-6 ---	0 0 0 ---	100 100 100 ---	100 100 100 ---	85-95 85-95 85-95 ---	60-75 65-90 65-90 ---	25-35 20-40 20-40 ---	5-10 5-15 5-15 ---
26*: Cabbart-----	0-4 4-12 12	Loam----- Loam, clay loam, silty clay loam. Weathered bedrock.	CL-ML CL ---	A-4 A-6 ---	0 0 ---	100 100 ---	100 100 ---	85-95 85-100 ---	60-75 65-95 ---	20-30 30-40 ---	5-10 10-15 ---
Hillon-----	0-4 4-60	Clay loam----- Loam, clay loam	CL CL	A-6 A-6	0-5 0-5	85-100 85-100	85-100 80-100	85-95 80-90	70-80 65-80	25-35 25-35	10-20 10-20
27*: Cabbart-----	0-4 4-12 12	Loam----- Loam, clay loam, silty clay loam. Weathered bedrock.	CL-ML CL ---	A-4 A-6 ---	0 0 ---	100 100 ---	100 100 ---	85-95 85-100 ---	60-75 65-95 ---	20-30 30-40 ---	5-10 10-15 ---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
28*: Cabbart-----	0-4	Loam-----	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	4-12	Loam, clay loam, silty clay loam.	CL	A-6	0	100	100	85-100	65-95	30-40	10-15
	12	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Yamac-----	0-4	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	4-60	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
Rock outcrop.											
29----- Castner	0-6	Gravelly loam---	GM, GM-GC	A-4, A-2	0-5	60-85	50-75	45-70	30-50	25-35	5-10
	6-13	Very channery loam, channery loam, cobbly loam.	GM	A-2, A-4, A-1	20-50	30-65	25-60	20-50	15-40	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
30*: Castner-----	0-6	Gravelly loam---	GM, GM-GC	A-4, A-2	0-5	60-85	50-75	45-70	30-50	25-35	5-10
	6-13	Very channery loam, channery loam, cobbly loam.	GM	A-2, A-4, A-1	20-50	30-65	25-60	20-50	15-40	25-35	NP-10
	13-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Perma-----	0-5	Gravelly loam---	GM, GM-GC, SM, SM-SC	A-4	15-35	60-80	55-75	50-65	35-50	20-30	NP-10
	5-60	Very gravelly sandy loam, very gravelly loam, very cobbly loam.	GM, GM-GC	A-2, A-1	15-55	50-60	40-50	30-40	15-35	20-30	NP-10
Rock outcrop.											
31, 32----- Chinook	0-6	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	15-30	NP-5
	6-54	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	15-30	NP-5
	54-60	Fine sandy loam, loamy fine sand.	SM	A-4, A-2	0	100	100	60-80	25-45	---	NP
33*: Chinook-----	0-6	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	15-30	NP-5
	6-54	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	15-30	NP-5
	54-60	Fine sandy loam, loamy fine sand.	SM	A-4, A-2	0	100	100	60-80	25-45	---	NP
Phillips-----	0-7	Loam-----	ML, CL-ML	A-4	0-5	90-95	80-95	80-95	65-75	25-35	5-10
	7-15	Clay, clay loam	CL	A-6, A-7	0-5	90-95	80-95	90-100	75-95	35-50	15-25
	15-36	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
	36-78	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
34----- Cozberg	0-7	Fine sandy loam	SM	A-4	0	95-100	95-100	70-85	35-50	15-25	NP-5
	7-26	Fine sandy loam, very fine sandy loam, sandy loam.	SM-SC, CL-ML	A-4	0	95-100	80-100	60-90	35-60	20-30	5-10
	26-60	Loamy sand, sand, gravelly loamy sand.	SM, SP-SM	A-1, A-2	0	85-100	60-95	40-70	15-30	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
35----- Creed	0-6	Loam-----	CL-ML, SM-SC	A-4	0	90-100	75-100	65-95	45-75	20-30	5-10
	6-12	Silty clay, clay, silty clay loam.	CL	A-6, A-7	0	90-100	75-100	70-100	60-95	35-50	15-25
	12-28	Silty clay loam, clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	75-100	60-100	35-90	30-40	15-20
	28-60	Stratified loam to silty clay loam.	CL	A-6	0	90-100	75-100	65-100	50-90	25-40	10-20
36*: Creed-----	0-6	Loam-----	CL-ML, SM-SC	A-4	0	90-100	75-100	65-95	45-75	20-30	5-10
	6-12	Silty clay, clay, silty clay loam.	CL	A-6, A-7	0	90-100	75-100	70-100	60-95	35-50	15-25
	12-28	Silty clay loam, clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	75-100	60-100	35-90	30-40	15-20
	28-60	Stratified loam to silty clay loam.	CL	A-6	0	90-100	75-100	65-100	50-90	25-40	10-20
Gerdrum-----	0-7	Clay loam-----	CL	A-6, A-7	0	90-100	90-100	90-100	75-95	35-45	15-20
	7-22	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	90-100	90-100	90-100	75-95	40-55	20-30
	22-46	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	80-95	45-75	30-45	10-20
	46-68	Gravelly sandy loam.	SM	A-2, A-1	0	60-85	50-75	30-55	15-30	---	NP
37----- Delpoint	0-4	Loam-----	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	4-16	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-95	65-90	20-40	5-15
	16-32	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-95	65-90	20-40	5-15
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---
38*: Delpoint-----	0-4	Loam-----	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	4-16	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-95	65-90	20-40	5-15
	16-32	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-95	65-90	20-40	5-15
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cabbart-----	0-4	Loam-----	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	4-12	Loam, clay loam, silty clay loam.	CL	A-6	0	100	100	85-100	65-95	30-40	10-15
	12	Weathered bedrock.	---	---	---	---	---	---	---	---	---
39----- Dimmick	0-60	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-70	25-45

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
40----- Elloam	0-3	Clay loam-----	CL	A-6	0-5	95-100	75-100	70-100	55-80	30-40	10-15
	3-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	75-100	70-100	55-95	35-45	15-25
	17-28	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	75-100	65-100	45-80	30-45	10-20
	28-62	Clay loam, loam	CL, SM, SC, ML	A-7	0-5	95-100	75-100	65-100	45-80	40-50	15-20
41----- Ethridge	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-20
	6-28	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-30
	28-60	Stratified loam to silty clay.	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-20
42*: Ethridge-----	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-20
	6-28	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-30
	28-60	Stratified loam to silty clay.	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-20
Gerdrum-----	0-7	Clay loam-----	CL	A-6, A-7	0	90-100	90-100	90-100	75-95	35-45	15-20
	7-22	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	90-100	90-100	90-100	75-95	40-55	20-30
	22-46	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	80-95	45-75	30-45	10-20
	46-68	Gravelly sandy loam.	SM	A-2, A-1	0	60-85	50-75	30-55	15-30	---	NP
43, 44, 45----- Farnuf	0-5	Loam-----	ML	A-4	0	90-100	90-100	75-100	55-90	25-35	NP-10
	5-24	Clay loam, loam, silty clay loam.	CL	A-6	0	90-100	75-100	65-95	50-90	25-40	10-20
	24-60	Loam, clay loam	CL, SC	A-6	0	90-100	75-100	65-95	45-80	25-40	10-20
46----- Gerdrum	0-7	Clay loam-----	CL	A-6, A-7	0	90-100	90-100	90-100	75-95	35-45	15-20
	7-22	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	90-100	90-100	90-100	75-95	40-55	20-30
	22-46	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	80-95	45-75	30-45	10-20
	46-68	Gravelly sandy loam.	SM	A-2, A-1	0	60-85	50-75	30-55	15-30	---	NP
47----- Glendive	0-24	Fine sandy loam	SM, SM-SC, ML	A-4	0	100	100	70-80	40-55	20-35	5-10
	24-60	Stratified loamy fine sand to loam.	SM	A-4, A-2	0	95-100	75-100	60-90	25-45	15-30	NP-5
48----- Hanly	0-3	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	---	NP
	3-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	100	100	50-85	5-25	---	NP
49----- Harlem	0-10	Loam-----	CL, ML	A-6, A-7	0	100	100	90-100	70-80	35-45	10-20
	10-46	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-40
	46-66	Stratified silt loam to fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	85-95	60-75	20-40	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
50----- Harlem	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-95	35-45	10-20
	10-46	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-40
	46-66	Stratified silt loam to fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	85-95	60-75	20-40	5-15
51----- Harlem	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-20
	10-46	Stratified clay loam to silty clay.	CL, CH	A-7	0	100	100	95-100	75-95	40-55	20-35
	46-60	Stratified loam to silty clay loam.	CL	A-6	0	100	100	80-90	65-85	25-40	10-20
52----- Harlem	0-10	Silty clay-----	CL, CH	A-7	0	100	100	90-100	75-90	40-65	20-40
	10-46	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-40
	46-60	Stratified silt loam to fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	85-95	60-75	20-40	5-15
53----- Harlem	0-6	Silty clay-----	CL, CH	A-7	0	100	100	90-100	80-95	40-65	20-40
	6-46	Stratified clay loam to silty clay.	CL, CH	A-7	0	100	100	95-100	75-95	40-55	20-35
	46-60	Stratified loam to silty clay loam.	CL	A-6	0	100	100	80-90	65-85	25-40	10-20
54*: Harlem Variant----	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-20
	7-28	Silty clay loam, silty clay.	CL	A-7	0	100	100	95-100	85-95	35-45	20-30
	28-44	Silty clay loam, silty clay.	CL	A-7	0	100	100	95-100	85-95	35-45	20-30
	44-60	Stratified loam to silty clay.	CL, CH	A-6, A-7	0	100	100	85-100	70-80	30-55	10-30
Lardell-----	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	8-29	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	35-45	15-25
	29-60	Stratified fine sandy loam to silty clay loam.	CL	A-6	0	100	100	80-90	65-85	25-40	10-20
55----- Havre	0-8	Loam-----	CL, CL-ML	A-4, A-6	0	100	100	80-95	60-90	20-40	5-15
	8-60	Stratified fine sandy loam to clay loam.	ML, CL-ML	A-4	0	100	100	80-95	50-70	15-25	NP-10
56----- Havre	0-8	Loam-----	ML, CL-ML	A-4	0	100	100	85-95	60-75	20-30	NP-10
	8-60	Stratified fine sandy loam to clay loam.	ML	A-4	0	100	100	75-100	50-70	15-25	NP-5
57----- Havre	0-8	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
	8-60	Stratified fine sandy loam to clay loam.	ML, CL-ML	A-4	0	100	100	80-95	50-70	15-25	NP-10
58----- Havre	0-10	Silty clay loam	CL	A-6	0	100	100	90-100	85-95	25-40	10-20
	10-60	Stratified fine sandy loam to clay loam.	ML	A-4	0	100	100	75-100	50-70	15-25	NP-5

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
59*: Havre-----	0-8	Loam-----	ML, CL-ML	A-4	0	100	100	80-95	60-75	20-30	NP-10
	8-60	Stratified fine sandy loam to clay loam.	CL-ML	A-4	0	100	100	80-95	50-70	15-25	NP-10
Hanly-----	0-3	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	---	NP
	3-60	Stratified fine sandy loam to sand.	SM, SP-SM	A-2, A-3	0	100	100	50-85	5-25	---	NP
Glendive-----	0-7	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2	0	100	100	65-85	30-55	20-30	NP-10
	7-60	Stratified loamy fine sand to loam.	SM	A-2, A-4	0	95-100	75-100	60-80	25-45	20-30	NP-5
60*: Havre Variant----	0-7	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	25-40	10-20
	7-19	Silty clay loam	CL	A-6	0	100	100	95-100	85-95	25-40	10-20
	19-60	Stratified fine sandy loam to silty clay loam.	ML, SM	A-4	0	100	100	75-100	35-90	25-35	NP-10
Lardell-----	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	8-29	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	35-45	15-25
	29-60	Stratified fine sandy loam to silty clay loam.	CL	A-6	0	100	100	80-90	65-85	25-40	10-20
61, 62- Hedoes-----	0-4	Loam-----	ML, SM	A-4	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	4-17	Loam, sandy loam	ML, SM	A-4	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	17-34	Coarse sandy loam, gravelly sandy loam, sandy loam.	SM	A-1, A-2	0-15	85-95	75-85	45-60	20-30	---	NP
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM	A-1	0-15	45-65	30-55	15-35	10-20	---	NP
63*, 64*: Hedoes-----	0-4	Loam-----	ML, SM	A-4	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	4-17	Loam, sandy loam	ML, SM	A-4	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	17-34	Coarse sandy loam, gravelly sandy loam, sandy loam.	SM	A-1, A-2	0-15	85-95	75-85	45-60	20-30	---	NP
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM	A-1	0-15	45-65	30-55	15-35	10-20	---	NP
Belain-----	0-4	Loam-----	ML, CL-ML	A-4	0-5	95-100	85-100	85-95	60-75	20-30	NP-10
	4-11	Sandy loam, loam	ML, SM	A-4	0-5	95-100	85-95	65-90	35-70	25-35	NP-5
	11-22	Gravelly sandy loam, gravelly loam.	ML, SM, GM	A-2, A-4	0-5	60-85	50-75	35-70	20-55	25-35	NP-5
	22-28	Very gravelly loam, very gravelly sandy loam.	GM	A-1, A-2	0-5	35-60	25-50	15-45	10-35	25-35	NP-5
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
65*: Hedoes-----	0-4	Loam-----	ML, SM	A-4	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	4-17	Loam, sandy loam	ML, SM	A-4	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	17-34	Coarse sandy loam, gravelly sandy loam, sandy loam.	SM	A-1, A-2	0-15	85-95	75-85	45-60	20-30	---	NP
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM	A-1	0-15	45-65	30-55	15-35	10-20	---	NP
Belain-----	0-4	Loam-----	ML, CL-ML	A-4	0-5	95-100	85-100	85-95	60-75	20-30	NP-10
	4-11	Sandy loam, loam	ML, SM	A-4	0-5	95-100	85-95	65-90	35-70	25-35	NP-5
	11-22	Gravelly sandy loam, gravelly loam.	ML, SM, GM	A-2, A-4	0-5	60-85	50-75	35-70	20-55	25-35	NP-5
	22-28	Very gravelly loam, very gravelly sandy loam.	GM	A-1, A-2	0-5	35-60	25-50	15-45	10-35	25-35	NP-5
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Castner-----	0-6	Gravelly loam---	GM, GM-GC	A-4, A-2	0-5	60-85	50-75	45-70	30-50	25-35	5-10
	6-13	Very channery loam, channery loam, cobbly loam.	GM	A-2, A-4, A-1	20-50	30-65	25-60	20-50	15-40	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
66*: Hedoes-----	0-4	Loam-----	ML, SM	A-4	0-15	85-100	75-100	65-95	45-75	25-35	NP-5
	4-17	Loam, sandy loam	ML, SM	A-4	0-15	90-100	85-100	65-95	45-75	25-35	NP-5
	17-34	Coarse sandy loam, gravelly sandy loam, sandy loam.	SM	A-1, A-2	0-15	85-95	75-85	45-60	20-30	---	NP
	34-60	Very gravelly coarse sandy loam, gravelly sandy loam.	GM	A-1	0-15	45-65	30-55	15-35	10-20	---	NP
Benz-----	0-13	Loam-----	ML	A-4	0	100	100	85-100	60-90	25-40	NP-10
	13-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	65-80	25-40	5-20
67----- Hillon	0-4	Clay loam-----	CL	A-6	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	4-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
68*: Hillon-----	0-4	Clay loam-----	CL	A-6	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	4-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Kevin-----	0-7	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	7-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
69*: Hillon-----	0-4	Clay loam-----	CL	A-6	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	4-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
Scobey-----	0-6	Clay loam-----	CL	A-6, A-7	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-19	Clay, clay loam	CH, CL	A-7	0-5	85-100	85-95	80-95	65-90	50-60	25-35
	19-60	Clay loam-----	CL	A-6, A-7	0-5	85-100	75-95	70-90	65-80	25-40	10-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
70*, 71*: Judith-----	0-7	Loam-----	ML	A-4	0-5	90-100	90-100	85-95	60-75	20-35	NP-10
	7-33	Clay loam, loam, gravelly clay loam.	CL, SC	A-6	0-5	65-100	55-100	45-95	35-80	25-40	10-15
	33-60	Very gravelly loam.	GM	A-1	0-10	45-55	25-35	20-35	15-25	20-30	NP-5
Windham-----	0-6	Gravelly loam---	ML, SM	A-4	0-15	70-95	60-75	50-80	35-65	25-35	NP-10
	6-60	Very gravelly clay loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6	0-15	35-70	25-60	20-55	15-50	25-35	5-15
72----- Kevin	0-3	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
73*: Kevin-----	0-3	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
Elloam-----	0-3	Clay loam-----	CL	A-6	0-5	95-100	75-100	70-100	55-80	30-40	10-15
	3-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	75-100	70-100	55-95	35-45	15-25
	17-28	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	75-100	65-100	45-80	30-45	10-20
	28-62	Clay loam, loam	CL, SM, SC, ML	A-7	0-5	95-100	75-100	65-100	45-80	40-50	15-20
74*: Kevin-----	0-3	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
Hillon-----	0-4	Clay loam-----	CL	A-6	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	4-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
75*: Korent-----	0-7	Loam-----	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	7-60	Loam, silt loam, sandy clay loam.	CL	A-6	0	100	100	80-95	50-75	25-35	10-15
Nesda-----	0-11	Sandy loam-----	ML, SM	A-4	0-5	90-100	85-100	65-95	35-75	---	NP
	11-60	Very gravelly sand, very cobbly sand, very gravelly loamy sand.	GP	A-1	15-75	20-40	10-20	5-15	0-5	---	NP
76----- Lardell	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	15-25
	8-29	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	35-45	15-25
	29-60	Stratified fine sandy loam to silty clay loam.	CL	A-6	0	100	100	80-90	65-85	25-40	10-20
77, 78----- Lihen	0-10	Loamy fine sand	SM	A-2	0	100	85-100	45-75	15-30	---	NP
	10-30	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0	100	85-100	45-75	15-35	---	NP
	30-60	Loamy fine sand, loamy sand, fine sand.	SM	A-2	0	100	85-100	45-75	15-35	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
79*: Lisam-----	0-17	Clay-----	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Dilts-----	0-7	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-75	25-50
	7-16	Shaly clay, clay, shaly silty clay.	CH	A-7	0-5	90-100	75-100	60-100	55-95	50-75	25-50
	16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
80*: Lisam-----	0-17	Clay-----	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Dilts-----	0-7	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-75	25-50
	7-16	Shaly clay, clay, shaly silty clay.	CH	A-7	0-5	90-100	75-100	60-100	55-95	50-75	25-50
	16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
81*: Lisam-----	0-17	Clay-----	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Hillon-----	0-4	Clay loam-----	CL	A-6	0-5	85-100	85-100	85-95	70-80	25-35	10-20
	4-60	Loam, clay loam	CL	A-6	0-5	85-100	80-100	80-90	65-80	25-35	10-20
82*: Lisam-----	0-17	Clay-----	CH	A-7	0	100	100	90-100	80-95	50-75	25-50
	17	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Wabek-----	0-8	Gravelly loam---	SM	A-4	0	70-80	60-70	40-50	35-45	25-40	NP-10
	8-60	Very gravelly coarse sand, gravelly loamy coarse sand, sand.	SP, GP	A-1	0	40-60	35-50	10-40	0-5	---	NP
83----- Lolo	0-6	Loam-----	ML	A-4	0-10	90-100	90-100	80-90	60-75	25-35	NP-10
	6-22	Gravelly loam---	GM	A-2, A-4	0-10	55-70	50-60	40-55	25-45	20-35	NP-10
	22-60	Very gravelly loam, very gravelly fine sandy loam.	GM	A-1	0-10	30-45	30-35	25-30	15-25	20-35	NP-10
84*: Macmeal----- (north aspect)	0-7	Gravelly loam---	ML, SM	A-4	5-25	75-85	65-75	55-70	40-55	25-35	NP-5
	7-48	Very channery clay loam, very gravelly clay loam.	GC, SC	A-6, A-2	5-25	40-85	30-60	25-55	20-45	30-40	10-15
	48-60	Very channery clay loam, very flaggy clay loam.	GC	A-6, A-2	5-45	50-70	40-60	35-55	30-50	30-40	10-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct						
84*: Macmeal----- (south aspect)	0-5	Gravelly loam---	ML, SM	A-4	5-25	75-85	65-75	55-70	40-55	25-35	NP-5
	5-48	Very channery clay loam, very gravelly clay loam.	GC, SC	A-6, A-2	5-25	40-85	30-60	25-55	20-45	30-40	10-15
	48-60	Very channery clay loam, very flaggy clay loam.	GC	A-6, A-2	5-45	50-70	40-60	35-55	30-50	30-40	10-15
85*: Marmarth-----	0-6	Clay loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-80	20-40	5-20
	6-30	Clay loam, loam, fine sandy loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	5-20
	30-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Cabbart-----	0-4	Loam-----	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	4-12	Loam, clay loam, silty clay loam.	CL	A-6	0	100	100	85-100	65-95	30-40	10-15
	12	Weathered bedrock.	---	---	---	---	---	---	---	---	---
86----- Martinsdale	0-7	Clay loam-----	ML, CL, CL-ML	A-4, A-6	0-5	95-100	85-95	55-90	50-80	20-35	NP-15
	7-54	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	85-95	75-95	65-95	40-80	30-40	10-15
	54-60	Sandy clay loam, clay loam, gravelly clay loam.	SM-SC, SC, CL, CL-ML	A-4, A-6	0-5	75-95	65-95	60-90	40-70	25-35	5-15
87*: Martinsdale-----	0-7	Clay loam-----	ML, CL, CL-ML	A-4, A-6	0-5	95-100	85-95	55-90	50-80	20-35	NP-15
	7-54	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-5	85-95	75-95	65-95	40-80	30-40	10-15
	54-60	Sandy clay loam, clay loam, gravelly clay loam.	SM-SC, SC, CL, CL-ML	A-4, A-6	0-5	75-95	65-95	60-90	40-70	25-35	5-15
Judith-----	0-5	Loam-----	ML	A-4	0-5	90-100	90-100	85-95	60-75	20-35	NP-10
	5-33	Clay loam, loam, gravelly clay loam.	CL, SC	A-6	0-5	65-100	55-100	45-95	35-80	25-40	10-15
	33-60	Very gravelly loam.	GM	A-1	0-10	45-55	25-35	20-35	15-25	20-30	NP-5
88----- Marvan	0-7	Clay-----	CH	A-7	0	100	100	95-100	75-95	50-65	25-40
	7-60	Clay, silty clay	CH	A-7	0	100	100	95-100	75-95	50-65	25-40
89*: Marvan-----	0-7	Clay-----	CH	A-7	0	100	100	95-100	75-95	50-65	25-40
	7-60	Clay, silty clay	CH	A-7	0	100	100	95-100	75-95	50-65	25-40
Bascovy-----	0-6	Clay-----	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	6-10	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	10-15	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	15-23	Clay, silty clay	CH	A-7	0	90-100	75-100	75-95	55-95	50-65	25-35
	23	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
90----- Nishon	0-12	Loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-95	65-75	20-35	5-15
	12-60	Clay, silty clay, clay loam	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-55	20-35
91----- Nishon	0-5	Clay loam-----	CL	A-6, A-7	0	100	100	85-100	60-80	30-45	10-20
	5-60	Clay-----	CL, CH	A-6, A-7	0	100	100	90-100	75-95	35-55	20-35
92----- Norbert	0-10	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	10-14	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	14	Weathered bedrock.	---	---	---	---	---	---	---	---	---
93*: Norbert-----	0-10	Clay-----	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	10-14	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	14	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
94*: Perma-----	0-5	Gravelly loam---	GM, GM-GC, SM, SM-SC	A-4	15-35	60-80	55-75	50-65	35-50	20-30	NP-10
	5-60	Very gravelly sandy loam, very gravelly loam, very cobbly loam.	GM, GM-GC,	A-2, A-1	15-55	50-60	40-50	30-40	15-35	20-30	NP-10
Castner-----	0-6	Gravelly loam---	GM, GM-GC	A-4, A-2	0-5	60-85	50-75	45-70	30-50	25-35	5-10
	6-13	Very channery loam, channery loam, cobbly loam.	GM	A-2, A-4, A-1	20-50	30-65	25-60	20-50	15-40	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Belain-----	0-4	Loam-----	ML, CL-ML	A-4	0-5	95-100	85-100	85-95	60-75	20-30	NP-10
	4-11	Sandy loam, loam	ML, SM	A-4	0-5	95-100	85-95	65-90	35-70	25-35	NP-5
	11-22	Gravelly sandy loam, gravelly loam.	ML, SM, GM	A-2, A-4	0-5	60-85	50-75	35-70	20-55	25-35	NP-5
	22-28	Very gravelly loam, very gravelly sandy loam.	GM	A-1, A-2	0-5	35-60	25-50	15-45	10-35	25-35	NP-5
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
95, 96----- Phillips	0-7	Loam-----	ML, CL-ML	A-4	0-5	90-95	80-95	80-95	65-75	25-35	5-10
	7-15	Clay, clay loam	CL	A-6, A-7	0-5	90-95	80-95	90-100	75-95	35-50	15-25
	15-36	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
	36-78	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
97*, 98*: Phillips-----	0-7	Loam-----	ML, CL-ML	A-4	0-5	90-95	80-95	80-95	65-75	25-35	5-10
	7-15	Clay, clay loam	CL	A-6, A-7	0-5	90-95	80-95	90-100	75-95	35-50	15-25
	15-36	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
	36-78	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
Elloam-----	0-3	Clay loam-----	CL	A-6	0-5	95-100	75-100	70-100	55-80	30-40	10-15
	3-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	75-100	70-100	55-95	35-45	15-25
	17-28	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	75-100	65-100	45-80	30-45	10-20
	28-62	Clay loam, loam	CL, SM, SC, ML	A-7	0-5	95-100	75-100	65-100	45-80	40-50	15-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
99*, 100*: Phillips-----	<u>In</u>										
	0-7	Loam-----	ML, CL-ML	A-4	0-5	90-95	80-95	80-95	65-75	25-35	5-10
	7-15	Clay, clay loam	CL	A-6, A-7	0-5	90-95	80-95	90-100	75-95	35-50	15-25
	15-36	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
	36-78	Clay loam-----	CL	A-6, A-7	0-5	90-95	80-95	90-100	70-80	30-45	10-20
Kevin-----	0-3	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
101. Pits											
102, 103----- Reeder	0-7	Loam-----	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-85	20-40	5-20
	7-28	Clay loam, loam	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	60-80	25-50	5-30
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
104: Rubble land. Rock outcrop.											
105----- Savage	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	6-14	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	14-60	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
106----- Savage	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	6-14	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	14-60	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
107*: Savage-----	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-25
	6-14	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	14-60	Silty clay, silty clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
Gerdrum-----	0-7	Clay loam-----	ML, CL-ML	A-4	0	90-100	90-100	85-95	60-75	25-35	5-10
	7-22	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	90-100	90-100	90-100	75-95	40-55	20-30
	22-46	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	80-95	45-75	30-45	10-20
	46-60	Gravelly sandy loam.	SM	A-2, A-1	0	60-85	50-75	30-55	15-30	---	NP
108----- Scobey	0-6	Clay loam-----	CL	A-6, A-7	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-19	Clay, clay loam	CH, CL	A-7	0-5	85-100	85-95	80-95	65-90	50-60	25-35
	19-60	Clay loam-----	CL	A-6, A-7	0-5	85-100	75-95	70-90	65-80	25-40	10-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
109*, 110*: Scobey-----	0-6	Clay loam-----	CL	A-6, A-7	0-5	85-100	75-95	70-90	65-80	25-40	10-20
	6-19	Clay, clay loam	CH, CL	A-7	0-5	85-100	85-95	80-95	65-90	50-60	25-35
	19-60	Clay loam-----	CL	A-6, A-7	0-5	85-100	75-95	70-90	65-80	25-40	10-20
Kevin-----	0-3	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
111----- Shaak	0-6	Loam-----	CL	A-6	0	90-100	90-100	85-95	65-90	25-35	10-15
	6-20	Clay, silty clay	CL, CH	A-7	0	90-100	90-100	90-100	75-95	45-60	25-35
	20-42	Silty clay, gravelly sandy clay loam, clay loam.	CL, SC	A-6, A-7	0-5	75-100	65-90	55-85	40-65	35-50	15-25
	42-60	Very gravelly loam, very gravelly clay loam, very gravelly sandy loam.	GM, GC, GM-GC	A-4, A-6, A-2, A-1	0-5	35-60	25-50	15-45	10-40	20-40	NP-15
112*: Shaak-----	0-6	Loam-----	CL	A-6	0	90-100	90-100	85-95	65-90	25-35	10-15
	6-20	Clay, silty clay	CL, CH	A-7	0	90-100	90-100	90-100	75-95	45-60	25-35
	20-42	Silty clay, gravelly sandy clay loam, clay loam.	CL, SC	A-6, A-7	0-5	75-100	65-90	55-85	40-65	35-50	15-25
	42-60	Very gravelly loam, very gravelly clay loam, very gravelly sandy loam.	GM, GC, GM-GC	A-4, A-6, A-2, A-1	0-5	35-60	25-50	15-45	10-40	20-40	NP-15
Gerdrum-----	0-7	Clay loam-----	CL	A-6, A-7	0	90-100	90-100	90-100	75-95	35-45	15-20
	7-22	Clay, clay loam, silty clay loam.	CL, CH	A-7	0	90-100	90-100	90-100	75-95	40-55	20-30
	22-46	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	80-95	45-75	30-45	10-20
	46-60	Gravelly sandy loam.	SM	A-2, A-1	0	60-85	50-75	30-55	15-30	---	NP
113, 114----- Shawmut	0-3	Gravelly loam---	ML, GM, SM	A-4, A-2	0-10	65-85	55-75	45-70	20-55	20-35	NP-10
	3-15	Very gravelly clay loam, very gravelly sandy clay loam, very gravelly loam.	GC, GM-GC	A-2, A-4, A-6	10-25	40-65	30-55	20-50	15-45	20-35	5-15
	15-60	Very gravelly loam.	GM, SM	A-2, A-4, A-1	10-25	45-70	30-55	25-50	20-50	20-35	NP-10
115*: Silverchief-----	0-5	Loam-----	ML, CL-ML	A-4	0-5	100	90-100	75-95	55-75	20-30	NP-10
	5-20	Clay, silty clay	CL, CH	A-7	0-5	95-100	90-95	90-95	80-95	40-60	20-35
	20-27	Gravelly clay, gravelly silty clay.	CL, CH	A-7	5-10	75-90	55-75	50-75	50-70	40-60	20-35
	27-60	Very gravelly sandy clay loam, very gravelly silty clay loam.	GC, CL	A-6, A-2	15-30	45-70	35-60	30-60	15-55	25-40	10-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
115*: Whitewcow-----	0-3	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	3-20	Gravelly loam, very gravelly loam.	GM, ML	A-2, A-4, A-1	0-15	40-85	30-75	25-70	20-55	25-35	NP-10
	20-60	Very gravelly loam.	GM	A-1	0-15	25-35	15-25	15-25	10-20	25-35	NP-10
Macmeal-----	0-7	Gravelly loam---	ML, SM	A-4	5-25	75-85	65-75	55-70	40-55	25-35	NP-5
	7-48	Very channery clay loam, very gravelly clay loam.	GC, SC	A-6, A-2	5-25	40-85	30-60	25-55	20-45	30-40	10-15
	48-60	Very channery clay loam, very flaggy clay loam.	GC	A-6, A-2	5-45	50-70	40-60	35-55	30-50	30-40	10-15
116*: Straw-----	0-7	Loam-----	CL	A-4, A-6	0	100	100	85-100	60-90	20-40	10-20
	7-21	Silt loam-----	ML	A-4	0	100	100	90-100	70-90	25-40	5-10
	21-60	Stratified silty clay loam to loamy sand.	SM	A-2, A-4	0	100	100	65-90	25-50	---	NP
Korent-----	0-7	Loam-----	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	7-60	Loam, silt loam, sandy clay loam.	CL	A-6	0	100	100	80-95	50-75	25-35	10-15
117*: Straw-----	0-7	Loam-----	CL	A-6	0	100	100	85-95	60-75	25-30	10-15
	7-21	Silt loam-----	ML	A-4	0	100	100	90-100	70-90	35-40	5-10
	21-60	Stratified silty clay loam to loamy clay.	SM	A-2, A-4	0	100	100	65-90	25-50	---	NP
Korent-----	0-7	Loam-----	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	7-60	Loam, silt loam, sandy clay loam.	CL	A-6	0	100	100	80-95	50-75	25-35	10-15
118*: Straw-----	0-7	Loam-----	CL	A-6	0	100	100	85-95	60-75	25-30	10-15
	7-21	Silt loam-----	ML	A-4	0	100	100	90-100	70-90	35-40	5-10
	21-60	Stratified silty clay to loamy sand.	SM	A-2, A-4	0	100	100	65-90	25-50	---	NP
Nesda-----	0-11	Loam-----	ML, SM	A-4	0-5	90-100	85-100	65-85	35-50	---	NP
	11-60	Very gravelly sand, very cobbly sand, very gravelly loamy sand.	GP	A-1	15-75	20-40	10-20	5-15	0-5	---	NP
119----- Telstad	0-7	Loam-----	CL-ML, ML	A-4	0-10	95-100	90-100	80-95	55-75	25-35	5-10
	7-18	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	90-100	90-100	70-80	35-45	10-20
	18-60	Clay loam-----	CL, ML	A-6, A-7	0-10	95-100	90-100	90-100	70-80	35-45	10-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>					<u>Pct</u>	
120*, 121*: Telstad-----	0-7	Loam-----	CL-ML, ML	A-4	0-10	95-100	90-100	80-95	55-75	25-35	5-10
	7-18	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	90-100	90-100	70-80	35-45	10-20
	18-60	Clay loam-----	CL, ML	A-6, A-7	0-10	95-100	90-100	90-100	70-80	35-45	10-20
Joplin-----	0-6	Loam-----	CL-ML, ML	A-4	0-5	95-100	95-100	85-90	60-75	25-35	5-10
	6-31	Loam, clay loam, gravelly loam.	CL-ML, CL, GM-GC, GC	A-4, A-6, A-2	0-5	55-95	50-95	45-90	30-75	25-40	5-15
	31-60	Loam, clay loam, gravelly loam.	CL-ML, CL, GM-GC, GC	A-4, A-6, A-2	0-5	55-95	50-95	45-90	30-75	25-40	5-15
122*: Telstad-----	0-7	Gravelly loam---	GM, GM-GC ML, CL-ML	A-2, A-4	0-10	55-80	50-70	40-65	25-55	25-35	5-10
	7-60	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	90-100	90-100	70-80	35-45	10-20
Joplin-----	0-6	Gravelly loam---	CL-ML, ML, GM-GC, GM	A-4, A-2	0-5	55-85	50-75	45-70	30-55	25-35	5-10
	6-31	Loam, clay loam, gravelly loam.	CL-ML, CL, GM-GC, GC	A-4, A-6, A-2	0-5	55-95	50-95	45-90	30-75	25-40	5-15
	31-60	Loam, clay loam, gravelly loam.	CL-ML, CL, GM-GC, GC	A-4, A-6, A-2	0-5	55-95	50-95	45-90	30-75	25-40	5-15
123*: Thoeny-----	0-6	Loam-----	CL	A-6	0-5	95-100	85-95	85-95	65-75	25-35	10-15
	6-12	Clay, clay loam	CL, CH	A-6, A-7	0-5	95-100	85-95	85-95	75-95	35-55	15-30
	12-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	85-95	85-95	70-80	30-45	15-25
	17-52	Clay loam, clay	CL	A-6, A-7	0-5	95-100	85-95	85-95	70-80	30-45	15-25
	52-60	Clay loam-----	CL	A-6, A-7	0-5	95-100	85-95	85-95	70-80	30-45	15-25
Elloam-----	0-3	Clay loam-----	CL	A-6	0-5	95-100	75-100	70-100	55-80	30-40	10-15
	3-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	75-100	70-100	55-95	35-45	15-25
	17-28	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	75-100	65-100	45-80	30-45	10-20
	28-62	Clay loam, loam	CL, SM, SC, ML	A-7	0-5	95-100	75-100	65-100	45-80	40-50	15-20
124*: Thoeny-----	0-6	Loam-----	CL	A-6	0-5	95-100	85-95	85-95	65-75	25-35	10-15
	6-12	Clay, clay loam	CL, CH	A-6, A-7	0-5	95-100	85-95	85-95	75-95	35-55	15-30
	12-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	85-95	85-95	70-80	30-45	15-25
	17-52	Clay loam, clay	CL	A-6, A-7	0-5	95-100	85-95	85-95	70-80	30-45	15-25
	52-60	Clay loam-----	CL	A-6, A-7	0-5	95-100	85-95	85-95	70-80	30-45	15-25
Kevin-----	0-3	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	3-30	Clay loam-----	CL	A-6	0-5	90-100	85-100	80-95	70-80	25-40	10-20
	30-60	Clay loam-----	CL	A-6, A-7	0-5	90-100	85-100	80-95	70-80	30-45	10-20
Elloam-----	0-3	Clay loam-----	CL	A-6	0-5	95-100	75-100	70-100	55-80	30-40	10-15
	3-17	Clay loam, clay	CL	A-6, A-7	0-5	95-100	75-100	70-100	55-95	35-45	15-25
	17-28	Clay loam, loam	CL, SC	A-6, A-7	0-5	95-100	75-100	65-100	45-80	30-45	10-20
	28-62	Clay loam, loam	CL, SM, SC, ML	A-7	0-5	95-100	75-100	65-100	45-80	40-50	15-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	<u>In</u>				<u>Pct</u>						
125----- Turner	0-7	Loam-----	CL-ML, ML	A-4	0-5	90-100	85-100	80-90	55-75	25-35	5-10
	7-26	Clay loam, sandy clay loam, gravelly loam.	CL	A-6	0-5	70-100	60-100	55-90	50-80	30-40	10-20
	26-30	Gravelly loamy sand.	GM, SM	A-1	10-20	55-75	50-65	25-35	10-20	---	NP
	30-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM	A-1	5-20	35-50	25-50	15-35	0-10	---	NP
126*: Turner-----	0-7	Loam-----	CL-ML, ML	A-4	0-5	90-100	85-100	80-90	55-75	25-35	5-10
	7-26	Clay loam, sandy clay loam, gravelly loam.	CL	A-6	0-5	70-100	60-100	55-90	50-80	30-40	10-20
	26-30	Gravelly loamy sand.	GM, SM	A-1	10-20	55-75	50-65	25-35	10-20	---	NP
	30-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM	A-1	5-20	35-50	25-50	15-35	0-10	---	NP
Beaverton-----	0-7	Gravelly loam---	GM-GC, GC, SC	A-2, A-4, A-6	0-10	60-75	50-60	45-60	30-50	20-40	5-15
	7-20	Very gravelly clay loam, gravelly clay loam.	GC, GP-GC	A-2, A-6	0-20	30-70	20-60	15-60	10-50	25-35	10-15
	20-60	Very gravelly loamy sand, very gravelly sand.	GP-GM, GP, GW, SP	A-1	0-20	30-55	20-35	10-25	0-10	---	NP
127*, 128*: Twilight-----	0-35	Fine sandy loam	SM	A-4	0	100	100	60-90	35-50	20-30	NP-5
	35-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Riedel-----	0-5	Fine sandy loam	SM, ML	A-4	0	95-100	85-100	60-85	35-55	20-30	NP-5
	5-24	Fine sandy loam, sandy loam, channery sandy loam.	SM, ML	A-2, A-4	0	80-100	60-90	40-85	25-55	20-30	NP-5
	24-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
129. Typic Fluvaquents											
130. Typic Ustifluents											
131. Ustic Torrifluents											
132----- Vanda	0-6	Clay-----	CL, CH	A-7	0	100	100	90-100	75-95	45-60	30-40
	6-60	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	30-40
133*, 134*: Vanda-----	0-6	Clay-----	CL, CH	A-7	0	100	100	90-100	75-95	45-60	30-40
	6-60	Clay, silty clay	CL, CH	A-7	0	100	100	90-100	80-95	45-60	30-40
Nobe-----	0-3	Clay-----	CL, CH	A-7	0	100	100	90-100	80-95	45-55	25-35
	3-60	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-35

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
135----- Vida	0-4	Clay loam-----	CL	A-4, A-6	0-15	90-100	90-100	85-95	70-80	20-40	10-20
	4-34	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
	34-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
136*: Vida	0-4	Clay loam-----	CL	A-4, A-6	0-15	90-100	90-100	85-95	70-80	20-40	10-20
	4-34	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
	34-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
Zahill-----	0-3	Clay loam-----	CL	A-6	0-10	90-100	90-100	85-95	70-80	20-40	10-20
	3-36	Clay loam, loam	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	70-80	25-40	5-20
	36-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	70-80	25-40	5-20
137----- Wabek	0-8	Gravelly loam---	SM	A-4	0	70-80	60-70	40-50	35-45	25-40	NP-10
	8-60	Very gravelly coarse sand, very gravelly loamy coarse sand, sand.	SP GP	A-1	0	40-60	35-50	10-40	0-5	---	NP
138*: Warneke-----	0-4	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	4-15	Very gravelly loam, very channery loam.	GM	A-1, A-2, A-4	0-15	40-60	30-50	25-45	20-40	25-35	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Whitecow-----	0-3	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	3-20	Gravelly loam, very gravelly loam.	GM, ML	A-2, A-4, A-1	0-15	40-85	30-75	25-70	20-55	25-35	NP-10
	20-60	Very gravelly loam.	GM	A-1	0-15	25-35	15-25	15-25	10-20	25-35	NP-10
Rock outcrop.											
139*: Whitecow-----	0-3	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	3-20	Gravelly loam, very gravelly loam.	GM, ML	A-2, A-4, A-1	0-15	40-85	30-75	25-70	20-55	25-35	NP-10
	20-60	Very gravelly loam.	GM	A-1	0-15	25-35	15-25	15-25	10-20	25-35	NP-10
Warneke-----	0-4	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	4-15	Very gravelly loam, very channery loam.	GM	A-1, A-2, A-4	0-15	40-60	30-50	25-45	20-40	25-35	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
140*: Whitecow-----	0-3	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	3-20	Gravelly loam, very gravelly loam.	GM, ML	A-2, A-4, A-1	0-15	40-85	30-75	25-70	20-55	25-35	NP-10
	20-60	Very gravelly loam.	GM	A-1	0-15	25-35	15-25	15-25	10-20	25-35	NP-10

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches Pct	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
140*: Whitewcow-----	In										
	0-3	Gravelly loam---	GM, ML, SM	A-4	0-15	65-85	55-75	45-70	35-55	25-35	NP-10
	3-20	Gravelly loam, very gravelly loam.	GM, ML	A-2, A-4, A-1	0-15	40-85	30-75	25-70	20-55	25-35	NP-10
	20-60	Very gravelly loam.	GM	A-1	0-15	25-35	15-25	15-25	10-20	25-35	NP-10
141----- Williams	0-6	Loam-----	CL-ML, CL	A-4, A-6, A-7	0-5	95-100	95-100	85-95	60-90	25-45	5-20
	6-20	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	60-80	30-50	10-30
	20-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	60-80	30-50	10-30
142*, 143*: Williams-----	0-6	Loam-----	CL-ML, CL	A-4, A-6, A-7	0-5	95-100	95-100	85-95	60-90	25-45	5-20
	6-20	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	60-80	30-50	10-30
	20-60	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	80-95	60-80	30-50	10-30
Vida-----	0-4	Loam-----	CL-ML	A-4	0-15	90-100	85-95	80-90	60-75	20-30	5-10
	4-34	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
	34-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
144----- Windham	0-6	Cobbly loam----	CL-ML, CL, SC, SM-SC	A-4, A-6	15-30	80-95	70-85	60-80	45-70	25-35	5-15
	6-60	Very gravelly clay loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6	0-15	35-70	25-60	20-55	15-50	25-35	5-15
145, 146----- Work	0-6	Clay loam-----	CL	A-6	0-10	90-100	90-100	90-100	70-80	30-40	10-20
	6-13	Clay, clay loam	CL, CH	A-7	0-10	90-100	90-100	90-100	75-90	40-55	20-30
	13-29	Clay loam, loam	CL, CL-ML	A-6, A-4	0-10	90-100	90-100	85-95	60-75	25-35	5-15
	29-60	Gravelly clay loam, gravelly loam, clay loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	0-10	60-90	50-85	45-80	35-70	25-40	5-20
147----- Yamac	0-4	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	4-11	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	11-60	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
148*: Yamac-----	0-4	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	4-11	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	11-60	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
Benz-----	0-13	Loam-----	ML	A-4	0	100	100	85-100	60-90	25-40	NP-10
	13-60	Stratified fine sandy loam to clay loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	65-80	25-40	5-20
149*: Yamac-----	0-4	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	4-11	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
	11-60	Loam-----	ML	A-4, A-6	0	95-100	95-100	85-95	60-75	20-40	NP-15
Wabek-----	0-8	Gravelly loam---	SM	A-4	0	70-80	60-700	40-50	35-45	25-40	NP-10
	8-60	Very gravelly coarse sand, very gravelly loamy coarse sand.	SP GP	A-1	0	40-60	35-50	10-40	0-5	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
150----- Zahill	0-3	Clay loam-----	CL	A-6	0-10	90-100	90-100	85-95	70-80	20-40	10-20
	3-36	Clay loam, loam	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	70-80	25-40	5-20
	36-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	70-80	25-40	5-20
151*: Zahill-----	0-3	Clay loam-----	CL	A-6	0-10	90-100	90-100	85-95	70-80	20-40	10-20
	3-36	Clay loam, loam	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	70-80	25-40	5-20
	36-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-10	90-100	90-100	85-95	70-80	25-40	5-20
Vida-----	0-4	Clay loam-----	CL	A-4, A-6	0-15	90-100	90-100	85-95	70-80	20-40	8-20
	4-22	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20
	22-60	Clay loam, loam	CL, CL-ML	A-4, A-6	0-15	90-100	90-100	85-95	70-80	25-40	5-20

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
1*:									
Absher-----	0-3	<0.06	0.14-0.18	6.6-8.4	4-8	High-----	0.49	5	7
	7-20	<0.06	0.12-0.16	>7.3	4-16	High-----	0.49		
	20-60	<0.06	0.12-0.16	>7.8	>8	High-----	0.49		
Nobe-----	0-7	<0.06	0.07-0.09	6.6-8.4	4-8	High-----	0.37	5	4
	7-60	<0.06	0.07-0.09	7.9-9.0	16-25	High-----	0.43		
2-----									
Assinniboine	0-9	2.0-6.0	0.10-0.14	6.6-7.3	<2	Low-----	0.24	5	3
	9-21	0.6-2.0	0.12-0.16	7.4-7.8	<2	Low-----	0.32		
	21-60	2.0-6.0	0.10-0.14	7.9-8.4	<2	Low-----	0.32		
3-----									
Attewan	0-6	0.6-2.0	0.14-0.20	6.6-7.3	<2	Low-----	0.37	3	5
	6-20	0.6-2.0	0.12-0.18	6.6-7.8	<2	Moderate	0.32		
	20-25	0.6-2.0	0.11-0.19	7.4-8.4	<2	Low-----	0.37		
	25-60	>6.0	0.01-0.04	7.4-8.4	<2	Low-----	0.10		
4*:									
Attewan-----	0-6	0.6-2.0	0.14-0.20	6.6-7.3	<2	Low-----	0.37	3	5
	6-20	0.6-2.0	0.12-0.18	6.6-7.8	<2	Moderate	0.32		
	20-25	0.6-2.0	0.11-0.19	7.4-8.4	<2	Low-----	0.37		
	25-60	>6.0	0.01-0.04	7.4-8.4	<2	Low-----	0.10		
Beaverell-----	0-3	0.6-2.0	0.11-0.14	6.6-7.8	<2	Low-----	0.32	2	5
	3-11	0.6-2.0	0.07-0.11	6.6-7.8	<2	Low-----	0.32		
	11-17	0.6-2.0	0.05-0.10	7.4-7.8	<2	Low-----	0.17		
	17-60	>6.0	0.02-0.06	7.4-7.8	<2	Low-----	0.10		
5*:									
Attewan-----	0-6	0.6-2.0	0.14-0.20	6.6-7.3	<2	Low-----	0.37	3	5
	6-20	0.6-2.0	0.12-0.18	6.6-7.8	<2	Moderate	0.32		
	20-25	0.6-2.0	0.11-0.19	7.4-8.4	<2	Low-----	0.37		
	25-60	>6.0	0.01-0.04	7.4-8.4	<2	Low-----	0.10		
Wabek-----	0-8	2.0-6.0	0.20-0.22	6.6-7.3	<2	Low-----	0.28	2	5
	8-60	>20	0.02-0.04	7.4-7.8	<2	Low-----	0.10		
6.									
Badland									
7-----									
Barkof	0-7	0.06-0.2	0.12-0.18	7.4-8.4	<2	High-----	0.37	2	4
	7-28	0.06-0.2	0.12-0.18	7.9-9.0	2-4	High-----	0.32		
	28-60	---	---	---	---	-----	---		
8*:									
Barkof-----	0-7	0.06-0.2	0.12-0.18	7.4-8.4	<2	High-----	0.37	2	4
	7-28	0.06-0.2	0.12-0.18	7.9-9.0	2-4	High-----	0.32		
	28-60	---	---	---	---	-----	---		
Norbert-----	0-10	<0.06	0.12-0.16	7.4-8.4	<4	High-----	0.37	1	4
	10-14	<0.06	0.12-0.16	7.4-8.4	2-4	High-----	0.32		
	14	---	---	---	---	-----	---		
9*:									
Barkof-----	0-7	0.06-0.2	0.12-0.18	7.4-8.4	<2	High-----	0.37	2	4
	7-28	0.06-0.2	0.12-0.18	7.9-9.0	2-4	High-----	0.32		
	28-60	---	---	---	---	-----	---		
Norbert-----	0-7	<0.06	0.12-0.16	7.4-8.4	<4	High-----	0.37	1	4
	7-14	<0.06	0.12-0.16	7.4-8.4	2-4	High-----	0.32		
	14	---	---	---	---	-----	---		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
10*:									
Barkof-----	0-7	<.06-0.2	0.12-0.18	7.4-8.4	<2	High-----	0.37	2	4
	7-28	<.06-0.2	0.12-0.18	7.9-9.0	2-4	High-----	0.32		
	28-60	---	---	---	---	---	---		
Windham-----	0-6	0.6-2.0	0.11-0.16	7.4-8.4	<4	Low-----	0.32	2	5
	6-60	0.6-2.0	0.05-0.09	7.9-8.4	<4	Low-----	0.20		
11-----	0-6	<0.06	0.11-0.17	6.6-8.4	2-4	High-----	0.37	2	4
Bascovy-----	6-10	<0.06	0.11-0.17	6.1-7.8	2-4	High-----	0.37		
	10-15	<0.06	0.11-0.17	6.1-7.8	2-4	High-----	0.37		
	15-23	<0.06	0.11-0.17	5.1-7.3	2-8	High-----	0.37		
	23	---	---	---	---	---	---		
12*:									
Bascovy-----	0-6	<0.06	0.11-0.17	6.6-8.4	2-4	High-----	0.37	2	4
	6-10	<0.06	0.11-0.17	6.1-7.8	2-4	High-----	0.37		
	10-15	<0.06	0.11-0.17	6.1-7.8	2-4	High-----	0.37		
	15-23	<0.06	0.11-0.17	5.1-7.3	2-8	High-----	0.37		
	23	---	---	---	---	---	---		
Lisam-----	0-17	0.06-0.2	0.14-0.18	6.6-8.4	2-4	High-----	0.32	1	4
	17-60	---	---	---	---	---	---		
Dilts-----	0-16	0.06-0.2	0.15-0.18	4.5-7.3	<2	High-----	0.32	1	4
	16-60	---	---	---	---	---	---		
13-----	0-6	0.2-0.6	0.15-0.18	6.1-7.8	<2	Moderate	0.37	5	6
Bearpaw-----	6-23	0.2-0.6	0.15-0.18	6.6-8.4	<2	High-----	0.43		
	23-39	0.2-0.6	0.15-0.18	7.4-8.4	2-4	Moderate	0.43		
	39-60	0.06-0.2	0.15-0.18	7.4-9.0	2-8	Moderate	0.49		
14*, 15*:									
Bearpaw-----	0-6	0.2-0.6	0.15-0.18	6.1-7.8	<2	Moderate	0.37	5	6
	6-23	0.2-0.6	0.15-0.18	6.6-8.4	<2	High-----	0.43		
	23-39	0.2-0.6	0.15-0.18	7.4-8.4	2-4	Moderate	0.43		
	39-60	0.06-0.2	0.15-0.18	7.4-9.0	2-8	Moderate	0.49		
Elloam-----	0-3	0.6-2.0	0.12-0.18	6.1-7.8	<2	Moderate	0.32	5	6
	3-17	0.06-0.2	0.10-0.12	6.6-8.4	2-8	High-----	0.28		
	17-28	0.06-0.2	0.10-0.12	7.9-9.0	>4	Moderate	0.28		
	28-62	<0.06	0.08-0.12	>7.8	>4	Moderate	0.28		
16*, 17*:									
Bearpaw-----	0-6	0.2-0.6	0.15-0.18	6.1-7.8	<2	Moderate	0.37	5	6
	6-23	0.2-0.6	0.15-0.18	6.6-8.4	<2	High-----	0.43		
	23-39	0.2-0.6	0.15-0.18	7.4-8.4	2-4	Moderate	0.43		
	39-60	0.06-0.2	0.15-0.18	7.4-9.0	2-8	Moderate	0.49		
Vida-----	0-4	0.6-2.0	0.12-0.20	6.6-7.8	<2	Moderate	0.32	5	6
	4-34	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	34-60	0.06-0.2	0.12-0.20	8.4-9.0	<2	Moderate	0.37		
18-----	0-4	0.6-2.0	0.14-0.20	6.1-7.8	<2	Low-----	0.37	2	5
Belain-----	4-11	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.20		
	11-22	0.6-2.0	0.08-0.15	6.6-8.4	<2	Low-----	0.20		
	22-28	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low-----	0.15		
	28	---	---	---	---	---	---		
19-----	0-13	0.6-2.0	0.14-0.18	6.6-9.0	4-8	Low-----	0.37	5	6
Benz-----	13-60	0.06-0.2	0.10-0.18	>8.5	8-16	Moderate	0.37		
20-----	0-6	<0.06	0.10-0.13	7.9-8.4	8-16	High-----	0.37	5	4
Bowdoin-----	6-60	<0.06	0.10-0.13	>7.9	8-16	High-----	0.37		
21-----	0-12	0.6-2.0	0.15-0.22	7.4-8.4	<4	Moderate	0.37	4	6
Cabba-----	12	---	---	---	---	---	---		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
22*: Cabba-----	0-12 12	0.6-2.0 ---	0.15-0.22 ---	6.6-7.8 ---	<4 ---	Moderate ---	0.37 ---	2	6
Rock outcrop.									
23*: Cabba-----	0-12 12	0.6-2.0 ---	0.15-0.22 ---	6.6-7.8 ---	<4 ---	Moderate ---	0.37 ---	2	6
Windham-----	0-6 6-60	0.6-2.0 0.6-2.0	0.11-0.16 0.05-0.09	7.4-8.4 7.9-8.4	<4 <4	Low----- Low-----	0.32 0.20	2	5
24*: Cabba-----	0-12 12	0.6-2.0 ---	0.15-0.22 ---	6.6-7.8 ---	<4 ---	Moderate ---	0.37 ---	2	6
Zahill-----	0-3 3-60	0.6-2.0 0.2-0.6	0.12-0.20 0.12-0.20	7.4-8.4 7.4-8.4	<2 <2	Moderate Moderate	0.32 0.37	5	6
25*: Cabbart-----	0-4 4-12 12	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.18 ---	7.4-8.4 7.4-8.4 ---	2-4 2-8 ---	Low----- Moderate ---	0.37 0.37 ---	2	5
Delpoint-----	0-4 4-16 16-32 32	0.6-2.0 0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.20 0.12-0.20 ---	6.6-7.8 6.6-8.4 6.6-8.4 ---	<4 <4 <4 ---	Low----- Moderate Moderate ---	0.37 0.37 0.37 ---	3	5
26*: Cabbart-----	0-4 4-12 12	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.18 ---	7.4-8.4 7.4-8.4 ---	2-4 2-8 ---	Low----- Moderate ---	0.37 0.37 ---	2	5
Hillon-----	0-4 4-60	0.6-2.0 0.06-0.2	0.15-0.18 0.15-0.18	6.6-8.4 7.4-9.0	<2 <2	Moderate Moderate	0.32 0.32	5	6
27*: Cabbart-----	0-4 4-12 12	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.18 ---	7.4-8.4 7.4-8.4 ---	2-4 2-8 ---	Low----- Moderate ---	0.37 0.37 ---	2	5
Rock outcrop.									
28*: Cabbart-----	0-4 4-12 12	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.18 ---	7.4-8.4 7.4-8.4 ---	2-4 2-8 ---	Low----- Moderate ---	0.37 0.37 ---	2	5
Yamac-----	0-4 4-60	0.6-2.0 0.6-2.0	0.14-0.20 0.14-0.20	6.6-7.8 7.4-8.4	<2 <2	Low----- Low-----	0.37 0.37	5	5
Rock outcrop.									
29----- Castner	0-6 6-13 13	0.6-2.0 0.6-2.0 ---	0.08-0.12 0.04-0.09 ---	6.6-7.8 6.6-8.4 ---	<2 <2 ---	Low----- Low----- ---	0.24 0.24 ---	1	5
30*: Castner-----	0-6 6-13 13	0.6-2.0 0.6-2.0 ---	0.08-0.12 0.04-0.09 ---	6.6-7.8 6.6-8.4 ---	<2 <2 ---	Low----- Low----- ---	0.24 0.24 ---	1	5
Perma-----	0-5 5-60	0.6-2.0 0.6-2.0	0.08-0.15 0.03-0.08	6.1-7.3 7.4-8.4	<2 <2	Low----- Low-----	0.32 0.15	2	5

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
30*: Rock outcrop.									
31, 32----- Chinook	0-6 6-54 54-60	2.0-6.0 2.0-6.0 2.0-6.0	0.10-0.15 0.10-0.15 0.06-0.12	6.6-7.8 6.6-8.4 7.4-8.4	<2 <2 <2	Low----- Low----- Low-----	0.20 0.20 0.20	5	3
33*: Chinook-----	0-6 6-54 54-60	2.0-6.0 2.0-6.0 2.0-6.0	0.10-0.15 0.10-0.15 0.06-0.12	6.6-7.8 6.6-8.4 7.4-8.4	<2 <2 <2	Low----- Low----- Low-----	0.20 0.20 0.20	5	3
Phillips-----	0-7 7-15 15-36 36-78	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.14-0.20 0.12-0.14 0.12-0.16 0.10-0.14	6.1-7.3 6.6-8.4 7.4-8.4 7.4-8.4	<2 <2 <2 4-8	Low----- Moderate Moderate Moderate	0.43 0.37 0.43 0.43	5	5
34----- Cozberg	0-7 7-26 26-60	2.0-6.0 2.0-6.0 6.0-20	0.12-0.16 0.12-0.16 0.06-0.10	6.6-7.8 6.6-7.8 7.4-8.4	<2 <2 <2	Low----- Low----- Low-----	0.20 0.20 0.20	5	3
35----- Creed	0-6 6-12 12-28 28-60	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.14-0.18 0.12-0.18 0.14-0.18 0.14-0.18	6.6-7.8 6.6-8.4 7.9-9.0 7.9-9.0	<4 4-8 4-16 4-16	Low----- High----- Moderate Moderate	0.37 0.28 0.32 0.32	5	5
36*: Creed-----	0-6 6-12 12-28 28-60	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.14-0.18 0.12-0.18 0.14-0.18 0.14-0.18	6.6-7.8 6.6-8.4 7.9-9.0 7.9-9.0	<4 4-8 4-16 4-16	Low----- High----- Moderate Moderate	0.37 0.28 0.32 0.32	5	5
Gerdrum-----	0-7 7-22 22-46 46-68	0.2-0.6 0.06-0.2 0.06-0.2 0.6-2.0	0.12-0.18 0.12-0.19 0.10-0.16 0.10-0.16	6.6-7.8 7.4-9.0 7.9-9.0 7.9-9.0	<2 2-8 >8 >8	Moderate High----- Moderate Low-----	0.37 0.32 0.32 0.28	5	4
37----- Delpoint	0-4 4-16 16-32 32	0.6-2.0 0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.20 0.12-0.20 ---	6.6-7.8 6.6-8.4 6.6-8.4 ---	<4 <4 <4 ---	Low----- Moderate Moderate ---	0.37 0.37 0.37 ---	3	5
38*: Delpoint-----	0-4 4-16 16-32 32	0.6-2.0 0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.20 0.12-0.20 ---	6.6-7.8 6.6-8.4 6.6-8.4 ---	<4 <4 <4 ---	Low----- Moderate Moderate ---	0.37 0.37 0.37 ---	3	5
Cabbart-----	0-4 4-12 12	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.12-0.18 ---	7.4-8.4 7.4-8.4 ---	2-4 2-8 ---	Low----- Moderate ---	0.37 0.37 ---	2	5
39----- Dimmick	0-60	<0.06	0.13-0.18	6.6-7.8	<2	High-----	0.28	5	4
40----- Elloam	0-7 7-17 17-28 28-62	0.6-2.0 0.06-0.2 0.06-0.2 <0.06	0.12-0.18 0.10-0.12 0.10-0.12 0.08-0.12	6.1-7.8 6.6-8.4 7.9-9.0 >7.8	<2 2-8 >4 >4	Moderate High----- Moderate Moderate	0.32 0.28 0.28 0.28	5	6
41----- Ethridge	0-6 6-28 28-60	0.2-0.6 0.06-0.2 0.06-0.2	0.16-0.20 0.12-0.16 0.16-0.20	6.6-7.8 6.6-7.8 7.9-9.0	<2 <2 2-4	Moderate High----- Moderate	0.32 0.37 0.37	5	7

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
42*: Ethridge-----	0-6	0.2-0.6	0.16-0.20	6.6-7.8	<2	Moderate	0.32	5	7
	6-28	0.06-0.2	0.12-0.16	6.6-7.8	<2	High-----	0.37		
	28-60	0.06-0.2	0.16-0.20	7.9-9.0	2-4	Moderate	0.37		
Gerdrum-----	0-7	0.2-0.6	0.12-0.18	6.6-7.8	<2	Moderate	0.37	5	4
	7-22	0.06-0.2	0.12-0.19	7.4-9.0	2-8	High-----	0.32		
	22-46	0.06-0.2	0.10-0.16	7.9-9.0	>8	Moderate	0.32		
	46-68	0.6-2.0	0.10-0.16	7.9-9.0	>8	Low-----	0.28		
43, 44, 45----- Farnuf	0-5	0.6-2.0	0.15-0.20	6.1-7.8	<2	Low-----	0.32	5	6
	5-24	0.6-2.0	0.14-0.20	6.1-7.8	<2	Moderate	0.32		
	24-60	0.6-2.0	0.14-0.20	7.4-8.4	<2	Moderate	0.32		
46----- Gerdrum	0-7	0.2-0.6	0.12-0.18	6.6-7.8	<2	Moderate	0.37	5	4
	7-22	0.06-0.2	0.12-0.19	7.4-9.0	2-8	High-----	0.32		
	22-46	0.06-0.2	0.10-0.16	7.9-9.0	>8	Moderate	0.32		
	46-68	0.6-2.0	0.10-0.16	7.9-9.0	>8	Low-----	0.28		
47----- Glendive	0-24	0.6-2.0	0.12-0.18	6.6-8.4	<4	Low-----	0.20	5	3
	24-60	0.6-2.0	0.10-0.16	7.4-9.0	2-8	Low-----	0.20		
48----- Hanly	0-3	6.0-20	0.08-0.12	6.6-7.8	<2	Low-----	0.17	5	2
	3-60	6.0-20	0.05-0.14	6.6-7.8	<2	Low-----	0.17		
49----- Harlem	0-10	0.06-0.2	0.12-0.18	7.4-8.4	<4	Moderate	0.37	5	6
	10-46	0.06-0.2	0.14-0.18	7.4-8.4	<4	High-----	0.37		
	46-68	0.06-0.2	0.16-0.20	7.9-9.0	<8	Low-----	0.37		
50----- Harlem	0-10	0.06-0.2	0.14-0.18	7.4-8.4	<4	Moderate	0.37	5	7
	10-46	0.06-0.2	0.14-0.18	7.4-8.4	<4	High-----	0.37		
	46-60	0.06-0.2	0.16-0.20	7.9-9.0	<8	Low-----	0.37		
51----- Harlem	0-10	0.06-0.2	0.12-0.18	7.4-8.4	4-8	Moderate	0.37	5	4
	10-46	0.06-0.2	0.10-0.15	7.4-9.0	8-16	High-----	0.37		
	46-60	0.06-0.2	0.07-0.09	>7.9	8-16	Moderate	0.37		
52----- Harlem	0-10	0.06-0.2	0.14-0.18	7.4-8.4	<4	High-----	0.32	5	4
	10-46	0.06-0.2	0.14-0.18	7.4-8.4	<4	High-----	0.37		
	46-60	0.06-0.2	0.16-0.20	7.9-9.0	<8	Low-----	0.37		
53----- Harlem	0-6	0.06-0.2	0.10-0.16	7.4-8.4	4-8	High-----	0.32	5	4
	6-46	0.06-0.2	0.10-0.15	7.4-9.0	8-16	High-----	0.37		
	46-60	0.06-0.2	0.07-0.09	>7.9	8-16	Moderate	0.37		
54*: Harlem Variant--	0-7	0.06-0.2	0.11-0.17	7.9-9.0	>8	Moderate	0.37	5	7
	7-28	0.06-0.2	0.10-0.17	7.9-9.0	>8	High-----	0.28		
	28-44	0.06-0.2	0.10-0.17	7.9-9.0	>8	High-----	0.28		
	44-60	0.06-0.2	0.10-0.17	7.9-9.0	>8	Moderate	0.28		
Lardell-----	0-8	0.2-0.6	0.07-0.09	7.9-9.0	>16	High-----	0.37	5	4
	8-29	0.2-0.6	0.07-0.09	7.9-9.0	>16	Moderate	0.37		
	29-60	0.06-0.2	0.07-0.09	>7.9	>16	Moderate	0.37		
55----- Havre	0-8	0.6-2.0	0.16-0.22	7.4-8.4	<4	Low-----	0.37	5	5
	8-60	0.6-2.0	0.14-0.20	7.4-8.4	<8	Low-----	0.28		
56----- Havre	0-8	0.2-2.0	0.10-0.14	7.4-9.0	4-16	Low-----	0.28	5	7
	8-60	0.6-2.0	0.10-0.14	7.4-9.0	4-16	Low-----	0.28		
57----- Havre	0-8	0.2-0.6	0.14-0.18	7.4-8.4	<4	Moderate	0.37	5	7
	8-60	0.6-2.0	0.14-0.20	7.4-8.4	<8	Low-----	0.28		
58----- Havre	0-10	0.2-0.6	0.10-0.14	7.4-9.0	4-16	Moderate	0.37	5	5
	10-60	0.6-2.0	0.10-0.14	7.4-9.0	4-16	Low-----	0.28		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
59*:									
Havre-----	0-8	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low-----	0.37	5	5
	8-60	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.28		
Hanly-----	0-3	6.0-20	0.08-0.12	6.6-7.8	<2	Low-----	0.17	5	2
	3-60	6.0-20	0.05-0.14	6.6-7.8	<2	Low-----	0.17		
Glendive-----	0-7	0.6-2.0	0.12-0.18	6.6-8.4	<4	Low-----	0.20	5	3
	7-60	0.6-2.0	0.14-0.16	7.4-9.0	2-8	Low-----	0.20		
60*:									
Havre Variant---	0-7	0.2-0.6	0.10-0.12	7.9-9.0	8-16	Moderate	0.32	5	7
	7-19	0.2-0.6	0.10-0.12	7.9-9.0	8-16	Moderate	0.32		
	19-60	0.2-0.6	0.09-0.12	7.9-9.0	8-16	Low-----	0.28		
Lardell-----	0-8	0.2-0.6	0.07-0.09	7.9-9.0	>16	High-----	0.37	5	4
	8-29	0.2-0.6	0.07-0.09	7.9-9.0	>16	Moderate	0.37		
	29-60	0.06-0.2	0.07-0.09	>7.9	>16	Moderate	0.37		
61, 62-----	0-4	0.6-2.0	0.14-0.19	6.6-7.3	<2	Low-----	0.32	3	5
Hedoes	4-17	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.28		
	17-34	2.0-6.0	0.06-0.16	7.4-8.4	<4	Low-----	0.15		
	34-60	2.0-6.0	0.04-0.06	7.4-8.4	<4	Low-----	0.15		
63*, 64*:									
Hedoes-----	0-4	0.6-2.0	0.14-0.19	6.6-7.3	<2	Low-----	0.32	3	5
	4-17	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.28		
	17-34	2.0-6.0	0.06-0.16	7.4-8.4	<4	Low-----	0.15		
	34-60	2.0-6.0	0.04-0.06	7.4-8.4	<4	Low-----	0.15		
Belain-----	0-4	0.6-2.0	0.14-0.20	6.1-7.8	<2	Low-----	0.37	2	5
	4-11	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.20		
	11-22	0.6-2.0	0.08-0.15	6.6-8.4	<2	Low-----	0.20		
	22-28	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low-----	0.15		
	28	---	---	---	---	---	---		
65*:									
Hedoes-----	0-4	0.6-2.0	0.14-0.19	6.6-7.3	<2	Low-----	0.32	3	5
	4-17	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.28		
	17-34	2.0-6.0	0.06-0.16	7.4-8.4	<4	Low-----	0.15		
	34-60	2.0-6.0	0.04-0.06	7.4-8.4	<4	Low-----	0.15		
Belain-----	0-4	0.6-2.0	0.14-0.20	6.1-7.8	<2	Low-----	0.37	2	5
	4-11	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.20		
	11-22	0.6-2.0	0.08-0.15	6.6-8.4	<2	Low-----	0.20		
	22-28	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low-----	0.15		
	28	---	---	---	---	---	---		
Castner-----	0-6	0.6-2.0	0.08-0.12	6.6-7.8	<2	Low-----	0.24	1	5
	6-13	0.6-2.0	0.04-0.09	6.6-8.4	<2	Low-----	0.24		
	13	---	---	---	---	---	---		
66*:									
Hedoes-----	0-4	0.6-2.0	0.14-0.19	6.6-7.3	<2	Low-----	0.32	3	5
	4-17	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.28		
	17-34	2.0-6.0	0.06-0.16	7.4-8.4	<4	Low-----	0.15		
	34-60	2.0-6.0	0.04-0.06	7.4-8.4	<4	Low-----	0.15		
Benz-----	0-13	0.6-2.0	0.14-0.18	6.6-9.0	4-8	Low-----	0.37	5	6
	13-60	0.06-0.2	0.10-0.18	>8.5	8-16	Moderate	0.37		
67-----	0-4	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32	5	6
Hillon	4-60	0.06-0.2	0.15-0.18	7.4-9.0	<2	Moderate	0.32		
68*:									
Hillon-----	0-4	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	4-60	0.06-0.2	0.15-0.18	7.4-9.0	<2	Moderate	0.32		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
68*:									
Kevin-----	0-3	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	3-30	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.32		
	30-60	0.06-0.2	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
69*:									
Hillon-----	0-4	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	4-60	0.06-0.2	0.15-0.18	7.4-9.0	<2	Moderate	0.32		
Scobey-----	0-6	0.6-2.0	0.14-0.18	6.6-7.8	<2	Moderate	0.32	5	6
	6-19	0.2-0.6	0.12-0.16	6.6-7.8	<2	High-----	0.28		
	19-60	0.06-0.2	0.14-0.18	7.4-9.0	<2	Moderate	0.32		
70*, 71*:									
Judith-----	0-7	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low-----	0.37	3	5
	7-33	0.6-2.0	0.12-0.18	7.9-9.0	<4	Moderate	0.37		
	33-60	0.6-2.0	0.08-0.10	7.9-9.0	<4	Low-----	0.28		
Windham-----	0-6	0.6-2.0	0.11-0.16	7.4-8.4	<4	Low-----	0.32	2	5
	6-60	0.6-2.0	0.05-0.09	7.9-8.4	<4	Low-----	0.20		
72-----									
Kevin	0-3	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	3-30	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.32		
	30-60	0.06-0.2	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
73*:									
Kevin-----	0-3	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	3-30	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.32		
	30-60	0.06-0.2	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
Elloam-----	0-3	0.6-2.0	0.12-0.18	6.1-7.8	<2	Moderate	0.32	5	6
	3-17	0.06-0.2	0.10-0.12	6.6-8.4	2-8	High-----	0.28		
	17-28	0.06-0.2	0.10-0.12	7.9-9.0	>4	Moderate	0.28		
	28-62	<0.06	0.08-0.12	>7.8	>4	Moderate	0.28		
74*:									
Kevin-----	0-3	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	3-30	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.32		
	30-60	0.06-0.2	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
Hillon-----	0-4	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	4-60	0.06-0.2	0.15-0.18	7.4-9.0	<2	Moderate	0.32		
75*:									
Korent-----	0-7	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.37	5	5
	7-60	0.6-2.0	0.12-0.22	7.9-8.4	<2	Low-----	0.37		
Nesda-----	0-11	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.20	2	5
	11-60	>6.0	0.02-0.04	7.4-8.4	<2	Low-----	0.10		
76-----									
Lardell	0-8	0.2-0.6	0.07-0.09	7.9-9.0	>16	High-----	0.37	5	4
	8-29	0.2-0.6	0.07-0.09	7.9-9.0	>16	Moderate	0.37		
	29-60	0.06-0.2	0.07-0.09	>7.9	>16	Moderate	0.37		
77, 78-----									
Lihen	0-10	6.0-20	0.06-0.12	6.6-7.8	<2	Low-----	0.17	5	2
	10-30	6.0-20	0.06-0.12	6.6-7.8	<2	Low-----	0.17		
	30-60	6.0-20	0.08-0.14	7.4-8.4	<2	Low-----	0.17		
79*:									
Lisam-----	0-17	0.06-0.2	0.14-0.18	6.6-8.4	2-4	High-----	0.32	1	4
	17	---	---	---	---	---	---		
Dilts-----	0-7	0.06-0.2	0.15-0.18	5.6-7.3	<2	High-----	0.32	1	4
	7-16	0.06-0.2	0.09-0.12	4.5-5.0	<2	High-----	0.32		
	16	---	---	---	---	---	---		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
80*:									
Lisam-----	0-17	<0.2	0.14-0.18	6.6-8.4	2-4	High-----	0.32	1	4
	17	---	---	---	---	-----	---		
Dilts-----	0-7	<0.2	0.15-0.18	5.6-7.3	<2	High-----	0.32	1	4
	7-16	<0.2	0.09-0.12	4.5-5.0	<2	High-----	0.32		
	16	---	---	---	---	-----	---		
Rock outcrop.									
81*:									
Lisam-----	0-17	<0.2	0.14-0.18	6.6-8.4	2-4	High-----	0.32	1	4
	17	---	---	---	---	-----	---		
Hillon-----	0-4	0.6-2.0	0.15-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	4-60	0.06-0.2	0.15-0.18	7.4-9.0	<2	Moderate	0.32		
82*:									
Lisam-----	0-17	<0.2	0.14-0.18	6.6-8.4	2-4	High-----	0.32	1	4
	17	---	---	---	---	-----	---		
Wabek-----	0-8	2.0-6.0	0.20-0.22	6.6-7.3	<2	Low-----	0.28	2	5
	8-60	>20	0.02-0.04	7.4-7.8	<2	Low-----	0.10		
83-----									
Lolo	0-6	2.0-6.0	0.10-0.18	6.6-7.3	<2	Low-----	0.24	3	5
	6-22	2.0-6.0	0.10-0.14	6.6-7.3	<2	Low-----	0.24		
	22-60	2.0-6.0	0.06-0.08	6.6-8.4	<2	Low-----	0.20		
84*:									
Macmeal-----	0-7	0.6-2.0	0.10-0.13	6.1-7.3	<2	Low-----	0.28	2	5
(North aspect)	7-48	0.2-0.6	0.05-0.08	6.1-7.3	<2	Low-----	0.24		
	48-60	0.2-0.6	0.05-0.08	7.4-8.4	<2	Low-----	0.24		
Macmeal-----	0-5	0.6-2.0	0.10-0.13	6.1-7.3	<2	Low-----	0.28	2	5
(South aspect)	5-48	0.2-0.6	0.05-0.08	6.1-7.3	<2	Low-----	0.24		
	48-60	0.2-0.6	0.05-0.08	7.4-8.4	<2	Low-----	0.24		
85*:									
Marmarth-----	0-6	0.6-2.0	0.20-0.22	6.1-7.3	<2	Moderate	0.28	3	6
	6-30	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.28		
	30-60	---	---	---	---	-----	---		
Cabbart-----	0-4	0.6-2.0	0.14-0.20	7.4-8.4	2-4	Low-----	0.37	2	5
	4-12	0.6-2.0	0.12-0.18	7.4-8.4	2-8	Moderate	0.37		
	12	---	---	---	---	-----	---		
86-----									
Martinsdale	0-7	0.6-2.0	0.17-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	7-54	0.2-0.6	0.17-0.18	6.6-8.4	<2	Moderate	0.37		
	54-60	0.2-0.6	0.14-0.18	7.4-9.0	2-8	Moderate	0.37		
87*:									
Martinsdale-----	0-7	0.6-2.0	0.17-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	7-54	0.2-0.6	0.17-0.18	6.6-8.4	<2	Moderate	0.37		
	54-60	0.2-0.6	0.14-0.18	7.4-9.0	2-8	Moderate	0.37		
Judith-----	0-5	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low-----	0.37	3	5
	5-33	0.6-2.0	0.12-0.18	7.9-9.0	<4	Moderate	0.37		
	33-60	0.6-2.0	0.08-0.10	7.9-9.0	<4	Low-----	0.28		
88-----									
Marvan	0-7	0.06-0.2	0.12-0.18	7.9-8.4	<4	High-----	0.37	5	4
	7-60	<0.06	0.12-0.18	7.9-9.0	2-8	High-----	0.37		
89*:									
Marvan-----	0-7	0.06-0.2	0.12-0.18	7.9-8.4	<4	High-----	0.37	5	4
	7-60	<0.06	0.12-0.18	7.9-9.0	2-8	High-----	0.37		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
89*: Bascovy-----	0-6	<0.06	0.11-0.17	6.6-8.4	2-4	High-----	0.37	2	4
	6-10	<0.06	0.11-0.17	6.1-7.8	2-4	High-----	0.37		
	10-15	<0.06	0.11-0.17	6.1-7.8	2-4	High-----	0.37		
	15-23	<0.06	0.11-0.17	5.1-7.3	2-8	High-----	0.37		
	23	---	---	---	---	-----	---		
90----- Nishon	0-12	0.6-2.0	0.18-0.22	6.1-7.8	<2	Low-----	0.43	5	6
	12-60	0.06-0.2	0.12-0.18	6.6-9.0	<2	High-----	0.32		
91----- Nishon	0-5	0.6-2.0	0.12-0.20	6.1-7.8	<2	Moderate	0.37	5	6
	5-60	0.06-0.2	0.12-0.18	6.6-9.0	<2	High-----	0.32		
92----- Norbert	0-10	<0.06	0.12-0.16	7.4-8.4	<4	High-----	0.37	1	4
	10-14	<0.06	0.12-0.16	7.4-8.4	2-4	High-----	0.32		
	14	---	---	---	---	-----	---		
93*: Norbert-----	0-10	<0.06	0.12-0.16	7.4-8.4	<4	High-----	0.37	1	4
	10-14	<0.06	0.12-0.16	7.4-8.4	2-4	High-----	0.32		
	14	---	---	---	---	-----	---		
Rock outcrop.									
94*: Perma-----	0-5	0.6-2.0	0.08-0.15	6.1-7.3	<2	Low-----	0.32	2	5
	5-60	0.6-2.0	0.03-0.08	7.4-8.4	<2	Low-----	0.15		
Castner-----	0-6	0.6-2.0	0.08-0.12	6.6-7.8	<2	Low-----	0.24	1	5
	6-13	0.6-2.0	0.04-0.09	6.6-8.4	<2	Low-----	0.24		
	13	---	---	---	---	-----	---		
Belain-----	0-4	0.6-2.0	0.14-0.20	6.1-7.8	<2	Low-----	0.37	2	5
	4-11	0.6-2.0	0.10-0.20	6.6-8.4	<2	Low-----	0.20		
	11-22	0.6-2.0	0.08-0.15	6.6-8.4	<2	Low-----	0.20		
	22-28	2.0-6.0	0.06-0.09	7.4-8.4	<2	Low-----	0.15		
	28	---	---	---	---	-----	---		
95, 96----- Phillips	0-7	0.6-2.0	0.14-0.20	6.1-7.3	<2	Low-----	0.43	5	5
	7-15	0.06-0.2	0.12-0.14	6.6-8.4	<2	Moderate	0.37		
	15-36	0.06-0.2	0.12-0.16	7.4-8.4	<2	Moderate	0.43		
	36-78	0.06-0.2	0.10-0.14	7.4-8.4	4-8	Moderate	0.43		
97*, 98*: Phillips-----	0-7	0.6-2.0	0.14-0.20	6.1-7.3	<2	Low-----	0.43	5	5
	7-15	0.06-0.2	0.12-0.14	6.6-8.4	<2	Moderate	0.37		
	15-36	0.06-0.2	0.12-0.16	7.4-8.4	<2	Moderate	0.43		
	36-78	0.06-0.2	0.10-0.14	7.4-8.4	4-8	Moderate	0.43		
Elloam-----	0-3	0.6-2.0	0.12-0.18	6.1-7.8	<2	Moderate	0.32	5	6
	3-17	0.06-0.2	0.10-0.12	6.6-8.4	2-8	High-----	0.28		
	17-28	0.06-0.2	0.10-0.12	7.9-9.0	>4	Moderate	0.28		
	28-62	<0.06	0.08-0.12	>7.8	>4	Moderate	0.28		
99*, 100*: Phillips-----	0-7	0.6-2.0	0.14-0.20	6.1-7.3	<2	Low-----	0.43	5	5
	7-15	0.06-0.2	0.12-0.14	6.6-8.4	<2	Moderate	0.37		
	15-36	0.06-0.2	0.12-0.16	7.4-8.4	<2	Moderate	0.43		
	36-78	0.06-0.2	0.10-0.14	7.4-8.4	4-8	Moderate	0.43		
Kevin-----	0-3	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	3-30	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.32		
	30-60	0.06-0.2	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
101. Pits									

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
102, 103----- Reeder	0-7 7-28 28-60	0.6-2.0 0.6-2.0 ---	0.20-0.23 0.15-0.18 ---	6.1-7.3 6.6-8.4 ---	<2 <2 ---	Moderate Moderate -----	0.28 0.28 ---	3	6
104: Rubble land. Rock outcrop.									
105----- Savage	0-6 6-14 14-60	0.6-2.0 0.2-0.6 0.2-0.6	0.14-0.20 0.16-0.20 0.16-0.20	6.6-7.8 6.6-8.4 7.4-8.4	<2 2-8 2-8	Moderate High----- High-----	0.37 0.37 0.37	5	7
106----- Savage	0-6 6-14 14-60	0.6-2.0 0.2-0.6 0.2-0.6	0.14-0.20 0.16-0.20 0.16-0.20	6.6-7.8 6.6-8.4 7.4-8.4	<2 2-8 2-8	Moderate High----- High-----	0.37 0.37 0.37	5	7
107*: Savage-----	0-6 6-14 14-60	0.6-2.0 0.2-0.6 0.2-0.6	0.14-0.20 0.16-0.20 0.16-0.20	6.6-7.8 6.6-8.4 7.4-8.4	<2 2-8 2-8	Moderate High----- High-----	0.37 0.37 0.37	5	7
Gerdrum-----	0-7 7-22 22-46 46-60	0.6-2.0 0.06-0.2 0.06-0.2 0.6-2.0	0.12-0.18 0.12-0.19 0.10-0.16 0.10-0.16	6.6-7.8 7.4-9.0 7.9-9.0 7.9-9.0	<2 2-8 >8 >8	Low----- High----- Moderate Low-----	0.43 0.32 0.32 0.28	5	5
108----- Scobey	0-6 6-19 19-60	0.6-2.0 0.2-0.6 0.06-0.2	0.14-0.18 0.12-0.16 0.14-0.18	6.6-7.8 6.6-7.8 7.4-9.0	<2 <2 <2	Moderate High----- Moderate	0.32 0.28 0.32	5	6
109*, 110*: Scobey-----	0-6 6-19 19-60	0.6-2.0 0.2-0.6 0.06-0.2	0.14-0.18 0.12-0.16 0.14-0.18	6.6-7.8 6.6-7.8 7.4-9.0	<2 <2 <2	Moderate High----- Moderate	0.32 0.28 0.32	5	6
Kevin-----	0-7 7-30 30-60	0.6-2.0 0.2-0.6 0.06-0.2	0.14-0.18 0.14-0.18 0.14-0.18	6.6-8.4 6.6-8.4 7.9-9.0	<2 <2 <2	Moderate Moderate Moderate	0.32 0.32 0.37	5	6
111----- Shaak	0-6 6-20 20-42 42-60	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.18-0.22 0.12-0.15 0.14-0.19 0.07-0.10	6.1-7.8 7.4-8.4 7.9-8.4 7.9-8.4	<2 2-4 2-8 2-8	Low----- High----- Moderate Low-----	0.43 0.32 0.43 0.28	5	6
112*: Shaak-----	0-6 6-20 20-42 42-60	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.18-0.22 0.12-0.15 0.14-0.19 0.07-0.10	6.1-7.8 7.4-8.4 7.9-8.4 7.9-8.4	<2 2-4 2-8 2-8	Low----- High----- Moderate Low-----	0.43 0.32 0.43 0.28	5	6
Gerdrum-----	0-7 7-22 22-46 46-60	0.2-0.6 0.06-0.2 0.06-0.2 0.6-2.0	0.12-0.18 0.12-0.19 0.10-0.16 0.10-0.16	6.6-7.8 7.4-9.0 7.9-9.0 7.9-9.0	<2 2-8 >8 >8	Moderate High----- Moderate Low-----	0.37 0.32 0.32 0.28	5	4
113, 114----- Shawmut	0-3 3-15 15-60	0.6-2.0 0.6-2.0 0.6-2.0	0.11-0.16 0.06-0.10 0.08-0.11	6.6-7.8 6.6-8.4 7.9-8.4	<2 <2 <2	Low----- Low----- Low-----	0.37 0.24 0.24	3	5
115*: Silverchief----	0-5 5-20 20-27 27-60	0.6-2.0 0.2-0.6 0.2-0.6 0.2-0.6	0.14-0.20 0.12-0.18 0.10-0.17 0.05-0.10	6.1-7.3 6.6-7.8 6.6-7.8 7.4-8.4	<2 <2 <2 <2	Low----- High----- High----- Moderate	0.28 0.24 0.28 0.20	5	5

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
115*: Whitcow-----	0-3	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-----	0.32	3	5
	3-20	0.6-2.0	0.08-0.17	7.4-8.4	<2	Low-----	0.28		
	20-60	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low-----	0.24		
Macmeal-----	0-7	0.6-2.0	0.10-0.13	6.1-7.3	<2	Low-----	0.28	2	5
	7-48	0.2-0.6	0.05-0.08	6.1-7.3	<2	Low-----	0.24		
	48-60	0.2-0.6	0.05-0.08	7.4-8.4	<2	Low-----	0.24		
116*: Straw-----	0-7	0.6-2.0	0.12-0.22	6.6-8.4	<2	Moderate	0.32	5	6
	7-21	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-----	0.37		
	21-60	2.0-6.0	0.04-0.08	7.4-8.4	<2	Low-----	0.15		
Korent-----	0-7	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.37	5	5
	7-60	0.6-2.0	0.12-0.22	7.9-8.4	<2	Low-----	0.37		
117*: Straw-----	0-7	0.6-2.0	0.14-0.20	6.6-8.4	<2	Low-----	0.37	5	5
	7-21	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-----	0.37		
	21-60	2.0-6.0	0.02-0.04	7.4-8.4	<2	Low-----	0.15		
Korent-----	0-7	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.37	5	5
	7-60	0.6-2.0	0.12-0.22	7.9-8.4	<2	Low-----	0.37		
118*: Straw-----	0-7	0.6-2.0	0.14-0.20	6.6-8.4	<2	Low-----	0.37	5	5
	7-21	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-----	0.37		
	21-60	2.0-6.0	0.04-0.08	7.4-8.4	<2	Low-----	0.15		
Nesda-----	0-11	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.32	2	5
	11-60	>6.0	0.02-0.04	7.4-8.4	<2	Low-----	0.10		
119----- Telstad	0-7	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	7-18	0.6-2.0	0.12-0.16	7.4-8.4	<2	Moderate	0.43		
	18-60	0.06-0.2	0.12-0.16	7.9-8.4	2-4	Moderate	0.43		
120*, 121*: Telstad-----	0-7	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	7-18	0.6-2.0	0.12-0.16	7.4-8.4	<2	Moderate	0.43		
	18-60	0.06-0.2	0.12-0.16	7.9-8.4	2-4	Moderate	0.43		
Joplin-----	0-6	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	6-31	0.6-2.0	0.12-0.18	6.6-8.4	<2	Moderate	0.32		
	31-60	0.06-0.2	0.12-0.18	7.4-8.4	2-8	Moderate	0.32		
122*: Telstad-----	0-7	0.6-2.0	0.12-0.18	6.6-7.8	<2	Moderate	0.32	5	6
	7-60	0.6-2.0	0.12-0.16	7.4-8.4	<2	Moderate	0.43		
Joplin-----	0-6	0.6-2.0	0.10-0.18	6.6-7.8	<2	Low-----	0.32	5	6
	6-31	0.6-2.0	0.12-0.18	6.6-8.4	<2	Moderate	0.32		
	31-60	0.06-0.2	0.12-0.18	7.4-8.4	2-8	Moderate	0.32		
123*: Thoeny-----	0-6	0.6-2.0	0.16-0.20	5.6-7.8	0-4	Low-----	0.49	5	5
	6-12	<0.06	0.10-0.14	7.4-9.0	4-8	High-----	0.28		
	12-17	<0.06	0.10-0.14	7.4-9.0	4-8	Moderate	0.32		
	17-52	<0.06	0.10-0.14	>7.4	4-16	Moderate	0.32		
	52-60	<0.06	0.10-0.14	>7.4	4-16	Moderate	0.32		
Elloam-----	0-3	0.6-2.0	0.12-0.18	6.1-7.8	<2	Moderate	0.32	5	6
	3-17	<0.2	0.10-0.12	6.6-8.4	2-8	High-----	0.28		
	17-28	<0.2	0.10-0.12	7.9-9.0	>4	Moderate	0.28		
	28-62	<0.06	0.08-0.12	>7.8	>4	Moderate	0.28		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
124*:									
Thoeny-----	0-6	0.6-2.0	0.16-0.20	5.6-7.8	0-4	Low-----	0.49	5	5
	6-12	<0.06	0.10-0.14	7.4-9.0	4-8	High-----	0.28		
	12-17	<0.06	0.10-0.14	7.4-9.0	4-8	Moderate	0.32		
	17-52	<0.06	0.10-0.14	>7.4	4-16	Moderate	0.32		
	52-60	<0.06	0.10-0.14	>7.4	4-16	Moderate	0.32		
Kevin-----	0-7	0.6-2.0	0.14-0.18	6.6-8.4	<2	Moderate	0.32	5	6
	7-30	0.2-0.6	0.14-0.18	6.6-8.4	<2	Moderate	0.32		
	30-60	0.06-0.2	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
Elloam-----	0-7	0.6-2.0	0.12-0.18	6.1-7.8	<2	Moderate	0.32	5	6
	7-17	<0.2	0.10-0.12	6.6-8.4	2-8	High-----	0.28		
	17-28	<0.2	0.10-0.12	7.9-9.0	>4	Moderate	0.28		
	28-62	<0.06	0.08-0.12	>7.8	>4	Moderate	0.28		
125-----	0-7	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low-----	0.37	3	5
Turner	7-26	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.32		
	26-30	6.0-20	0.03-0.05	7.4-8.4	<2	Low-----	0.15		
	30-60	6.0-20	<0.03	7.4-8.4	<2	Low-----	0.10		
126*:									
Turner-----	0-7	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low-----	0.37	3	5
	7-26	0.6-2.0	0.16-0.20	7.4-8.4	<2	Moderate	0.32		
	26-30	6.0-20	0.03-0.05	7.4-8.4	<2	Low-----	0.15		
	30-60	6.0-20	<0.03	7.4-8.4	<2	Low-----	0.10		
Beaverton-----	0-7	0.6-2.0	0.11-0.15	6.6-8.4	<2	Low-----	0.37	3	5
	7-20	0.6-2.0	0.07-0.11	6.6-8.4	<2	Low-----	0.37		
	20-60	>6.0	0.02-0.06	6.6-8.4	<2	Low-----	0.15		
127*, 128*:									
Twilight-----	0-35	0.6-2.0	0.10-0.14	6.6-8.4	<2	Low-----	0.24	3	3
	35-60	---	---	---	---	---	---		
Riedel-----	0-5	0.6-2.0	0.13-0.16	7.4-8.4	<2	Low-----	0.24	3	3
	5-24	0.6-2.0	0.09-0.14	7.4-8.4	<2	Low-----	0.24		
	24-60	---	---	---	---	---	---		
129. Typic Fluvaquents									
130. Typic Ustifluvents									
131. Ustic Torrifluvents									
132-----	0-6	<0.06	0.08-0.12	>8.5	8-16	High-----	0.24	5	8
Vanda	6-60	<0.06	0.08-0.12	>8.5	8-16	High-----	0.24		
133*, 134*:									
Vanda-----	0-6	<0.06	0.08-0.12	>8.5	8-16	High-----	0.24	5	8
	6-60	<0.06	0.08-0.12	>8.5	8-16	High-----	0.24		
Nobe-----	0-3	<0.06	0.07-0.09	6.6-8.4	4-8	High-----	0.37	5	4
	3-60	<0.06	0.07-0.09	7.4-9.0	16-25	High-----	0.43		
135-----	0-4	0.6-2.0	0.12-0.20	6.6-7.8	<2	Moderate	0.32	5	6
Vida	4-34	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	34-60	0.06-0.2	0.12-0.20	8.4-9.0	<2	Moderate	0.37		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
136*:									
Vida-----	0-4	0.6-2.0	0.12-0.20	6.6-7.8	<2	Moderate	0.32	5	6
	4-34	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	34-60	0.06-0.2	0.12-0.20	8.4-9.0	<2	Moderate	0.37		
Zahill-----	0-3	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.32	5	6
	3-36	0.2-0.6	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	36-60	0.06-0.2	0.12-0.20	7.4-8.4	<2	Moderate	0.43		
137-----	0-8	2.0-6.0	0.20-0.22	6.6-7.3	<2	Low-----	0.28	2	5
Wabek	8-60	>20	0.02-0.04	7.4-8.4	<2	Low-----	0.10		
138*:									
Warneke-----	0-4	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-----	0.32	1	5
	4-15	0.6-2.0	0.08-0.11	7.9-8.4	<2	Low-----	0.28		
	15	---	---	---	---	---	---		
Whitecow-----	0-3	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-----	0.32	3	5
	3-20	0.6-2.0	0.08-0.17	7.4-8.4	<2	Low-----	0.28		
	20-60	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low-----	0.24		
Rock outcrop.									
139*:									
Whitecow-----	0-3	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-----	0.32	3	5
	3-20	0.6-2.0	0.08-0.17	7.4-8.4	<2	Low-----	0.28		
	20-60	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low-----	0.24		
Warneke-----	0-4	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-----	0.32	1	5
	4-15	0.6-2.0	0.08-0.11	7.9-8.4	<2	Low-----	0.28		
	15	---	---	---	---	---	---		
140*:									
Whitecow-----	0-3	0.6-2.0	0.12-0.17	7.4-8.4	<2	Low-----	0.32	3	5
	3-20	0.6-2.0	0.08-0.17	7.4-8.4	<2	Low-----	0.28		
	20-60	0.6-2.0	0.04-0.06	7.4-8.4	<2	Low-----	0.24		
141-----	0-6	0.6-2.0	0.17-0.24	6.6-7.3	<2	Low-----	0.28	5	6
Williams	6-20	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	0.28		
	20-60	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.37		
142*, 143*:									
Williams-----	0-6	0.6-2.0	0.17-0.24	6.6-7.3	<2	Low-----	0.28	5	6
	6-20	0.6-2.0	0.16-0.20	6.6-7.8	<2	Moderate	0.28		
	20-60	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.37		
Vida-----	0-4	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	4-34	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	34-60	0.06-0.2	0.12-0.20	8.4-9.0	<2	Moderate	0.37		
144-----	0-6	0.6-2.0	0.09-0.11	7.4-8.4	<4	Low-----	0.24	2	6
Windham	6-60	0.6-2.0	0.05-0.09	7.9-8.4	<4	Low-----	0.20		
145, 146-----	0-6	0.6-2.0	0.13-0.18	6.6-7.8	<2	Moderate	0.32	5	6
Work	6-13	0.2-0.6	0.13-0.18	6.6-7.8	<2	High-----	0.37		
	13-29	0.6-2.0	0.13-0.20	7.4-8.4	<4	Moderate	0.32		
	29-60	0.6-2.0	0.12-0.14	7.4-8.4	<4	Moderate	0.28		
147-----	0-4	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.37	5	5
Yamac	4-11	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.37		
	11-60	0.6-2.0	0.14-0.20	7.9-9.0	<4	Low-----	0.37		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
148*: Yamac-----	0-4	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	4-11	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.37		
	11-60	0.6-2.0	0.14-0.20	7.9-9.0	<4	Low-----	0.37		
Benz-----	0-13	0.6-2.0	0.14-0.18	6.6-9.0	4-8	Low-----	0.37	5	6
	13-60	0.06-0.2	0.10-0.18	>8.5	8-16	Moderate	0.37		
149*: Yamac-----	0-4	0.6-2.0	0.14-0.20	6.6-7.8	<2	Low-----	0.37	5	5
	4-11	0.6-2.0	0.14-0.20	7.4-8.4	<2	Low-----	0.37		
	11-60	0.6-2.0	0.14-0.20	7.9-9.0	<4	Low-----	0.37		
Wabek-----	0-8	2.0-6.0	0.20-0.22	6.6-7.3	<2	Low-----	0.28	2	5
	8-60	>20	0.02-0.04	7.4-7.8	<2	Low-----	0.10		
150----- Zahill	0-3	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.32	5	6
	3-36	0.2-0.6	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	36-60	0.06-0.2	0.12-0.20	7.4-8.4	<2	Moderate	0.43		
151*: Zahill-----	0-3	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.32	5	6
	3-36	0.2-0.6	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	36-60	0.06-0.2	0.12-0.20	7.4-8.4	<2	Moderate	0.43		
Vida-----	0-4	0.6-2.0	0.12-0.20	6.6-7.8	<2	Moderate	0.32	5	6
	4-22	0.6-2.0	0.12-0.20	7.4-8.4	<2	Moderate	0.37		
	22-60	0.06-0.2	0.12-0.20	8.4-9.0	<2	Moderate	0.37		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," and "apparent" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
1*: Absher-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Nobe-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
2----- Assinniboine	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
3----- Attewan	A	None-----	---	---	>6.0	---	---	>60	---	Moderate.
4*: Attewan-----	A	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Beaverell-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
5*: Attewan-----	A	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Wabek-----	A	None-----	---	---	>6.0	---	---	>60	---	Low.
6. Badland										
7----- Barkof	D	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
8*, 9*: Barkof-----	D	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
Norbert-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
10*: Barkof-----	D	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
Windham-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
11----- Bascovy	D	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
12*: Bascovy-----	D	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
Lisam-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Dilts-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
13----- Bearpaw	B	None-----	---	---	>6.0	---	---	>60	---	Low.
14*, 15*: Bearpaw-----	B	None-----	---	---	>6.0	---	---	>60	---	Low.
Elloam-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
16*, 17*: Bearpaw-----	B	None-----	---	---	>6.0	---	---	>60	---	Low.
Vida-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
18----- Belain	B	None-----	---	---	>6.0	---	---	20-40	Hard	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
19----- Benz	D	None-----	---	---	>6.0	---	---	>60	---	Moderate.
20----- Bowdoin	D	Rare-----	---	---	>6.0	---	---	>60	---	Low.
21----- Cabba	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
22*: Cabba----- Rock outcrop.	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
23*: Cabba----- Windham-----	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
24*: Cabba----- Zahill-----	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
25*: Cabbart----- Delpoint-----	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
	C	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
26*: Cabbart----- Hillon-----	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
27*: Cabbart----- Rock outcrop.	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
28*: Cabbart----- Yamac----- Rock outcrop.	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
29----- Castner	C	None-----	---	---	>6.0	---	---	10-20	Hard	Moderate.
30*: Castner----- Perma----- Rock outcrop.	C	None-----	---	---	>6.0	---	---	10-20	Hard	Moderate.
	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
31, 32----- Chinook	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
33*: Chinook----- Phillips-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
	C	None-----	---	---	>6.0	---	---	>60	---	Low.
34----- Cozberg	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
35----- Creed	D	None-----	---	---	>6.0	---	---	>60	---	Low.
36*: Creed-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Gerdrum-----	---	None-----	---	---	>6.0	---	---	>60	---	Low.
37----- Delpoint	C	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
38*: Delpoint-----	C	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Cabbart-----	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
39----- Dimmick	D	Frequent-----	Long-----	Apr-Jun	0-3.0	Apparent	Sep-Jun	>60	---	Moderate.
40----- Elloam	D	None-----	---	---	>6.0	---	---	>60	---	Low.
41----- Ethridge	B	None-----	---	---	>6.0	---	---	>60	---	Low.
42*: Ethridge-----	B	None-----	---	---	>6.0	---	---	>60	---	Low.
Gerdrum-----	---	None-----	---	---	>6.0	---	---	>60	---	Low.
43, 44, 45----- Farnuf	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
46----- Gerdrum	---	None-----	---	---	>6.0	---	---	>60	---	Low.
47----- Glendive	B	Rare-----	---	---	>6.0	---	---	>60	---	Moderate.
48----- Hanly	A	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Low.
49, 50, 52----- Harlem	C	Rare-----	---	---	>6.0	---	---	>60	---	Low.
51, 53----- Harlem	C/D	Rare-----	---	---	3.5-5.0	Apparent	May-Sep	>60	---	Low.
54*: Harlem Variant---	C	Rare-----	---	---	2.0-4.0	Apparent	Jun-Sep	>60	---	Low.
Lardell-----	C	Rare-----	---	---	1.0-5.0	Apparent	May-Aug	>60	---	Moderate.
55, 57----- Havre	B	Rare-----	---	---	>6.0	---	---	>60	---	Moderate.
56, 58----- Havre	C	Rare-----	---	---	3.5-5.0	Apparent	May-Aug	>60	---	Moderate.
59*: Havre-----	B	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Moderate.
Hanly-----	A	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Low.
Glendive-----	B	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
60*: Havre variant----	C	Rare-----	---	---	2.0-4.0	Apparent	Jul-Sep	>60	---	Moderate.
Lardell-----	C	Rare-----	---	---	1.0-5.0	Apparent	May-Aug	>60	---	Moderate.
61, 62----- Hedoes	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
63*, 64*: Hedoes-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Belain-----	B	None-----	---	---	>6.0	---	---	20-40	Hard	Moderate.
65*: Hedoes-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Belain-----	B	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Castner-----	C	None-----	---	---	>6.0	---	---	10-20	Hard	Moderate.
66*: Hedoes-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Benz-----	D	None-----	---	---	>6.0	---	---	>60	---	Moderate.
67----- Hillon	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
68*: Hillon-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Kevin-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
69*: Hillon-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Scobey-----	C	None-----	---	---	>6.0	---	---	>60	---	Low.
70*, 71*: Judith-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Windham-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
72----- Kevin	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
73*: Kevin-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Elloam-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
74*: Kevin-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Hillon-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
75*: Korent-----	B	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Moderate.
Nesda-----	A	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Low.
76----- Lardell	C	Rare-----	---	---	1.0-5.0	Apparent	May-Aug	>60	---	Moderate.
77, 78----- Lihen	A	None-----	---	---	>6.0	---	---	>60	---	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth Ft	Kind	Months	Depth In	Hardness	
79*: Lisam-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Dilts-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
80*: Lisam-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Dilts-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Rock outcrop.										
81*: Lisam-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Hillon-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
82*: Lisam-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Wabek-----	A	None-----	---	---	>6.0	---	---	>60	---	Low.
83----- Lolo	A	None-----	---	---	>6.0	---	---	>60	---	Moderate.
84*: Macmeal-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
85*: Marmarth-----	B	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Cabbart-----	C	None-----	---	---	>6.0	---	---	10-20	Rippable	Moderate.
86----- Martinsdale	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
87*: Martinsdale-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Judith-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
88----- Marvan	D	None-----	---	---	>6.0	---	---	>60	---	Low.
89*: Marvan-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Bascovy-----	D	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
90, 91----- Nishon	D	Frequent---	Long to very long.	Apr-Nov	0.5-3.0	Perched	Apr-Aug	>60	---	Moderate.
92----- Norbert	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
93*: Norbert-----	D	None-----	---	---	>6.0	---	---	10-20	Rippable	Low.
Rock outcrop.										
94*: Perma-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Castner-----	C	None-----	---	---	>6.0	---	---	10-20	Hard	Moderate.
Belain-----	B	None-----	---	---	>6.0	---	---	20-40	Hard	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
95, 96----- Phillips	C	None-----	---	---	>6.0	---	---	>60	---	Low.
97*, 98*: Phillips-----	C	None-----	---	---	>6.0	---	---	>60	---	Low.
Elloam-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
99*, 100*: Phillips-----	C	None-----	---	---	>6.0	---	---	>60	---	Low.
Kevin-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
101. Pits										
102, 103----- Reeder	B	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
104: Rubble land. Rock outcrop.										
105, 106----- Savage	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
107*: Savage-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Gerdrum-----	---	None-----	---	---	>6.0	---	---	>60	---	Low.
108----- Scobey	C	None-----	---	---	>6.0	---	---	>60	---	Low.
109*, 110*: Scobey-----	C	None-----	---	---	>6.0	---	---	>60	---	Low.
Kevin-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
111----- Shaak	D	None-----	---	---	>6.0	---	---	>60	---	Low.
112*: Shaak-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Gerdrum-----	---	None-----	---	---	>6.0	---	---	>60	---	Low.
113, 114----- Shawmut	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
115*: Silverchief-----	C	None-----	---	---	>6.0	---	---	>60	---	Low.
Whitcow-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Macmeal-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
116*: Straw-----	B	Rare-----	---	---	>6.0	---	---	>60	---	Moderate.
Korent-----	B	Rare-----	---	---	>6.0	---	---	>60	---	Moderate.
117*: Straw-----	B	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Moderate.
Korent-----	B	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
118*: Straw-----	B	Occasional	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Moderate.
Nesda-----	A	Occasional	Brief-----	Apr-Jun	>6.0	---	---	>60	---	Low.
119----- Telstad	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
120*, 121*, 122*: Telstad-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Joplin-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
123*: Thoeny-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Elloam-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
124*: Thoeny-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Kevin-----	C	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Elloam-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
125----- Turner	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
126*: Turner-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Beaverton-----	A	None-----	---	---	>6.0	---	---	>60	---	Moderate.
127*, 128*: Twilight-----	B	None-----	---	---	>6.0	---	---	20-40	Rippable	Low.
Riedel-----	B	None-----	---	---	>6.0	---	---	20-40	Rippable	Moderate.
129. Typic Fluvaquents										
130. Typic Ustifluvents										
131. Ustic Torrifluvents										
132----- Vanda	D	None-----	---	---	>6.0	---	---	>60	---	Low.
133*, 134*: Vanda-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
Nobe-----	D	None-----	---	---	>6.0	---	---	>60	---	Low.
135----- Vida	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
136*: Vida-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Zahill-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
137----- Wabek	A	None-----	---	---	>6.0	---	---	>60	---	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					<u>Ft</u>			<u>In</u>		
138*: Warneke-----	D	None-----	---	---	>6.0	---	---	10-20	Hard	Moderate.
Whitecow-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Rock outcrop.										
139*: Whitecow-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Warneke-----	D	None-----	---	---	>6.0	---	---	10-20	Hard	Moderate.
140*: Whitecow-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
141----- Williams	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
142*, 143*: Williams-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Vida-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
144----- Windham	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
145, 146----- Work	C	None-----	---	---	>6.0	---	---	>60	---	Low.
147----- Yamac	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
148*: Yamac-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Benz-----	D	None-----	---	---	>6.0	---	---	>60	---	Moderate.
149*: Yamac-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Wabek-----	A	None-----	---	---	>6.0	---	---	>60	---	Low.
150----- Zahill	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
151*: Zahill-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.
Vida-----	B	None-----	---	---	>6.0	---	---	>60	---	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Absher-----	Fine, montmorillonitic Borollic Natrargids
Assinniboine-----	Fine-loamy, mixed Aridic Argiborolls
Attewan-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Barkof-----	Fine, montmorillonitic frigid Vertic Ustochrepts
Bascovy-----	Fine, montmorillonitic Borollic Vertic Camborthids
Bearpaw-----	Fine, montmorillonitic Typic Argiborolls
Beaverell-----	Loamy-skeletal, mixed Aridic Argiborolls
Beaverton-----	Loamy-skeletal, mixed Typic Argiborolls
Belain-----	Coarse-loamy, mixed Typic Haploborolls
Benz-----	Fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Bowdoin-----	Very-fine, montmorillonitic (calcareous), frigid Ustertic Torrifluvents
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Castner-----	Loamy-skeletal, mixed Lithic Haploborolls
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Cozberg-----	Coarse-loamy, mixed Aridic Haploborolls
Creed-----	Fine, montmorillonitic Borollic Natrargids
Delpoint-----	Fine-loamy, mixed Borollic Camborthids
Dilts-----	Clayey, montmorillonitic, acid, frigid, shallow Ustic Torriorthents
Dimmick-----	Fine, montmorillonitic, frigid Vertic Haplaquolls
Elloam-----	Fine, montmorillonitic Borollic Natrargids
Ethridge-----	Fine, montmorillonitic Aridic Argiborolls
Farnuf-----	Fine-loamy, mixed Typic Argiborolls
Gerdrum-----	Fine, montmorillonitic Borollic Natrargids
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Hanly-----	Sandy, mixed, frigid Ustic Torrifluvents
Harlem-----	Fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents
Harlem Variant-----	Fine, montmorillonitic (calcareous), frigid Typic Fluvaquents
Havre-----	Fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Havre Variant-----	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Hedoes-----	Coarse-loamy, mixed Pachic Haploborolls
Hillon-----	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Joplin-----	Fine-loamy, mixed Aridic Argiborolls
Judith-----	Fine-loamy, carbonatic Typic Calciborolls
Kevin-----	Fine-loamy, mixed Aridic Argiborolls
Korent-----	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Lardell-----	Fine-loamy, mixed, frigid Aquollic Salorthids
Lihen-----	Sandy, mixed Entic Haploborolls
Lisam-----	Clayey, montmorillonitic (calcareous), frigid, shallow Ustic Torriorthents
Lolo-----	Loamy-skeletal, mixed Pachic Haploborolls
Macmeal-----	Loamy-skeletal, mixed Typic Eutroboralfs
Marmarth-----	Fine-loamy, mixed Aridic Argiborolls
Martinsdale-----	Fine-loamy, mixed Typic Argiborolls
Marvan-----	Fine, montmorillonitic (calcareous), frigid Ustertic Torriorthents
Nesda-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon-----	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe-----	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Norbert-----	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Perma-----	Loamy-skeletal, mixed Typic Haploborolls
Phillips-----	Fine, montmorillonitic Borollic Paleargids
Reeder-----	Fine-loamy, mixed Typic Argiborolls
Riedel-----	Coarse loamy, mixed (calcareous) frigid Ustic Torriorthents
Savage-----	Fine, montmorillonitic Typic Argiborolls
Scobey-----	Fine, montmorillonitic Aridic Argiborolls
Shaak-----	Fine, montmorillonitic Abruptic Argiborolls
Shawmut-----	Loamy-skeletal, mixed Typic Argiborolls
Silverchief-----	Fine, mixed Typic Eutroboralfs
Straw-----	Fine-loamy, mixed Cumulic Haploborolls
Telstad-----	Fine-loamy, mixed Aridic Argiborolls
Thoeny-----	Fine, montmorillonitic Borollic Natrargids
Turner-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Twilight-----	Coarse-loamy, mixed Borollic Camborthids
Vanda-----	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Vida-----	Fine-loamy, mixed Typic Argiborolls
Wabek-----	Sandy-skeletal, mixed Entic Haploborolls
Warneke-----	Loamy-skeletal, carbonatic, frigid Lithic Ustochrepts
Whitcow-----	Loamy-skeletal, carbonatic, frigid Typic Ustochrepts
Williams-----	Fine-loamy, mixed Typic Argiborolls

TABLE 14.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Windham-----	Loamy-skeletal, carbonatic Typic Calciborolls
Work-----	Fine, montmorillonitic Typic Argiborolls
Yamac-----	Fine-loamy, mixed Borollic Camborthids
Zahill-----	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

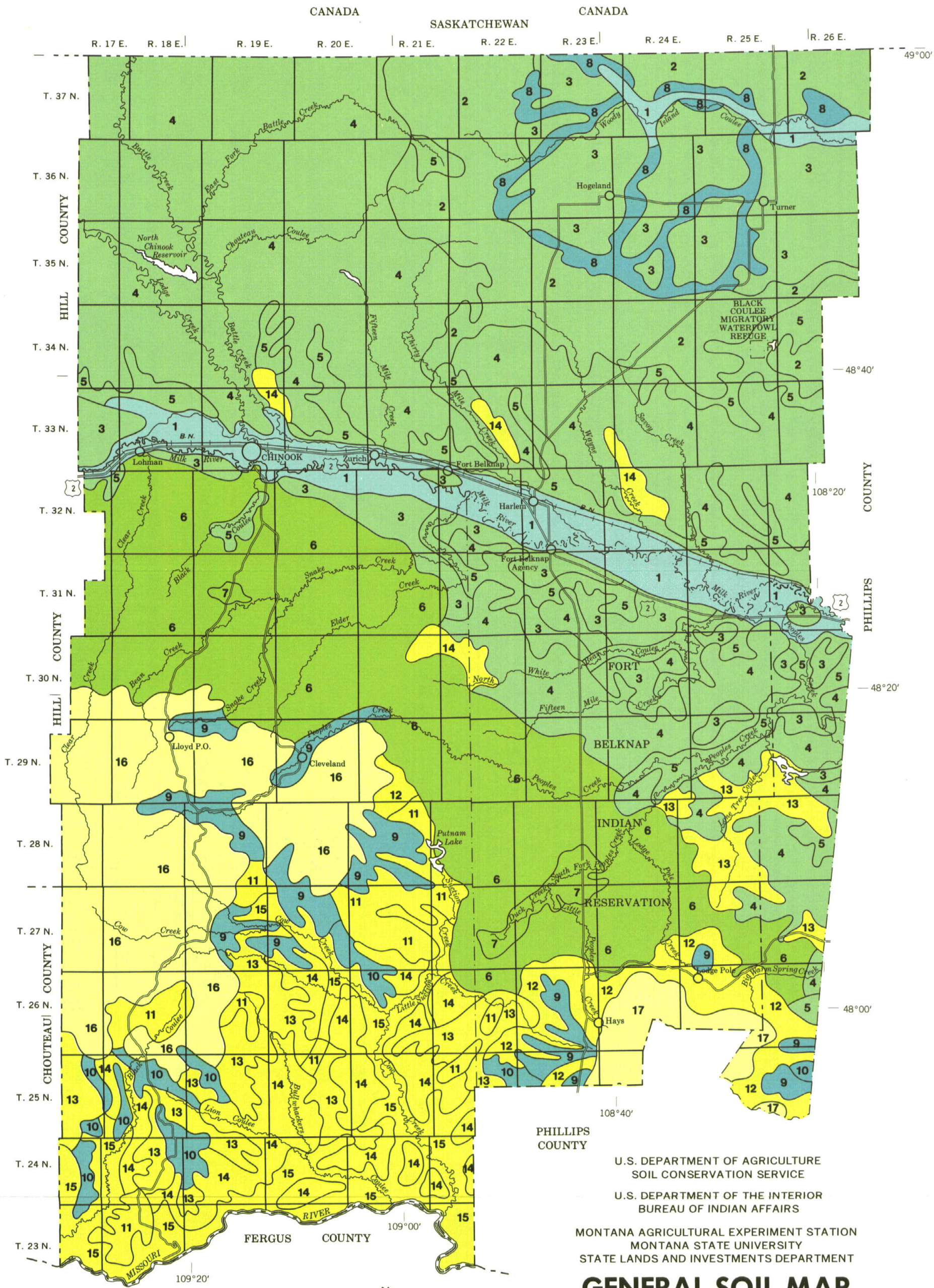
program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (<http://directives.sc.egov.usda.gov/33085.wba>).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (<http://directives.sc.egov.usda.gov/33086.wba>).



MAP UNITS*

- NEARLY LEVEL, DEEP, WELL DRAINED TO SOMEWHAT POORLY DRAINED SOILS ON FLOOD PLAINS AND STREAM TERRACES

1 Harlem-Havre-Lardell: Nearly level, deep, well drained to somewhat poorly drained, nonsalt-affected to very strongly salt-affected, nonsodium-affected to very strongly sodium-affected silty clay loams and loams

NEARLY LEVEL TO STEEP, DEEP AND SHALLOW, WELL DRAINED SOILS ON NORTHERN GLACIATED PLAINS

2 Kevin-Scobey-Hillon: Nearly level to steep, deep, well drained clay loams

3 Telstad-Joplin: Nearly level to gently rolling, deep, well drained loams

4 Phillips-Elloam-Thoeny: Nearly level to gently rolling, deep, well drained, nonsodium-affected and slightly sodium-affected loams and moderately sodium-affected clay loams

5 Hillon-Lisam-Cabbart: Moderately steep and steep, deep and shallow, well drained loams, clay loams, and clays

NEARLY LEVEL TO STEEP, DEEP, WELL DRAINED SOILS ON SOUTHERN GLACIATED PLAINS

6 Vida-Bearpaw-Zahill: Nearly level to steep, deep, well drained clay loams

7 Bearpaw-Vida-Elloam: Nearly level to gently rolling, deep, well drained clay loams; moderately sodium-affected in some areas

NEARLY LEVEL TO STEEP, DEEP, WELL DRAINED AND EXCESSIVELY DRAINED SOILS ON TERRACES AND FANS

8 Attewan-Wabek-Beaverell: Nearly level to steep, deep, well drained and excessively drained loams and gravelly loams

9 Martinsdale-Shawmut-Turner: Nearly level to gently rolling, deep, well drained clay loams, gravelly loams, and loams

10 Shaak-Attewan-Work: Nearly level to moderately sloping, deep, well drained loams and clay loams
- GENTLY SLOPING TO VERY STEEP, SHALLOW TO DEEP, WELL DRAINED SOILS ON SHALE AND SANDSTONE UPLANDS

11 Cabbart-Delpoint: Undulating to steep, shallow to moderately deep, well drained loams

12 Barkof-Cabba-Windham: Undulating to steep, shallow to deep, well drained clay loams and gravelly loams

13 Lisam-Dilts-Bascovy: Gently sloping to steep, shallow to moderately deep, well drained clays

14 Lisam-Dilts-Rock outcrop, shale: Steep, shallow, well drained clays and very steep shale outcrops

15 Badland-Cabbart: Steep and very steep badlands and moderately steep to very steep, shallow, well drained loams

GENTLY SLOPING TO VERY STEEP, SHALLOW TO DEEP, WELL DRAINED SOILS ON MOUNTAINS

16 Hedoes-Belain-Castner: Gently sloping to very steep, shallow to deep, well drained loams and gravelly loams

17 Whitecow-Macneal-Warneke: Steep and very steep, shallow and deep, well drained gravelly loams

*The terms for texture used in the descriptive heading apply to the surface layer of the major soils

Compiled 1979

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SOIL LEGEND

SYMBOL	NAME
1	Absher-Nobe complex, 0 to 4 percent slopes
2	Assinniboine fine sandy loam, 0 to 4 percent slopes
3	Attewan loam, 0 to 4 percent slopes
4	Attewan-Beaverell complex, 0 to 4 percent slopes
5	Attewan-Wabek complex, 0 to 4 percent slopes
6	Badland*
7	Barkof clay, 4 to 8 percent slopes
8	Barkof-Norbert clays, 2 to 8 percent slopes
9	Barkof-Norbert clays, 8 to 20 percent slopes
10	Barkof-Windham association, moderately steep*
11	Bascovy clay, 2 to 6 percent slopes
12	Bascovy-Lisam-Dilts clays, 2 to 8 percent slopes
13	Bearpaw clay loam, 0 to 4 percent slopes
14	Bearpaw-Elloam clay loams, 0 to 4 percent slopes
15	Bearpaw-Elloam clay loams, 4 to 8 percent slopes
16	Bearpaw-Vida clay loams, 0 to 4 percent slopes
17	Bearpaw-Vida clay loams, 4 to 8 percent slopes
18	Belain loam, 2 to 8 percent slopes
19	Benz loam, 0 to 4 percent slopes
20	Bowdoin clay
21	Cabba loam, 8 to 35 percent slopes
22	Cabba-Rock outcrop complex, 25 to 75 percent slopes
23	Cabba-Windham association, steep*
24	Cabba-Zahill association, steep*
25	Cabbart-Delpoint loams, 8 to 35 percent slopes
26	Cabbart-Hillon association, steep*
27	Cabbart-Rock outcrop, shale complex, 25 to 60 percent slopes
28	Cabbart-Yamac-Rock outcrop complex, 15 to 70 percent slopes
29	Castner gravelly loam, 8 to 35 percent slopes
30	Castner-Perma-Rock outcrop complex, 25 to 70 percent slopes*
31	Chinook fine sandy loam, 2 to 6 percent slopes
32	Chinook fine sandy loam, 6 to 12 percent slopes
33	Chinook-Phillips complex, 2 to 6 percent slopes
34	Cozberg fine sandy loam, 0 to 4 percent slopes
35	Creed loam, 0 to 4 percent slopes
36	Creed-Gerdrum complex, 0 to 4 percent slopes
37	Delpoint loam, 2 to 4 percent slopes
38	Delpoint-Cabbart loams, 2 to 8 percent slopes
39	Dimmick clay
40	Elloam clay loam, 0 to 4 percent slopes
41	Ethridge silty clay loam, 0 to 4 percent slopes
42	Ethridge-Gerdrum complex, 0 to 4 percent slopes
43	Farnuf loam, 0 to 2 percent slopes
44	Farnuf loam, 2 to 4 percent slopes
45	Farnuf loam, 4 to 8 percent slopes
46	Gerdrum clay loam, 0 to 4 percent slopes
47	Glendive fine sandy loam
48	Hanly loamy fine sand
49	Harlem loam
50	Harlem silty clay loam
51	Harlem silty clay loam, saline
52	Harlem silty clay
53	Harlem silty clay, saline
54	Harlem Variant-Lardell silty clay loams
55	Havre loam
56	Havre loam, saline
57	Havre silty clay loam
58	Havre silty clay loam, saline
59	Havre, Hanly and Glendive soils, channeled*
60	Havre Variant-Lardell silty clay loams
61	Hedoes loam, 2 to 4 percent slopes
62	Hedoes loam, 4 to 8 percent slopes
63	Hedoes-Belain loams, 4 to 15 percent slopes
64	Hedoes-Belain loams, 15 to 35 percent slopes
65	Hedoes-Belain-Castner complex, 15 to 60 percent slopes*
66	Hedoes-Benz loams, 2 to 4 percent slopes
67	Hillon clay loam, 25 to 45 percent slopes
68	Hillon-Kevin clay loams, 15 to 35 percent slopes
69	Hillon-Scobey clay loams, 4 to 20 percent slopes
70	Judith-Windham complex, 4 to 8 percent slopes
71	Judith-Windham complex, 8 to 15 percent slopes
72	Kevin clay loam, 2 to 8 percent slopes
73	Kevin-Elloam clay loams, 2 to 8 percent slopes
74	Kevin-Hillon clay loams, 8 to 15 percent slopes
75	Korent-Nesda complex, occasionally flooded
76	Lardell silty clay loam

*Broadly defined units

SYMBOL	NAME
77	Lihea loamy fine sand, 0 to 6 percent slopes
78	Lihea loamy fine sand, 6 to 12 percent slopes
79	Lisam-Dilts clays, 8 to 35 percent slopes
80	Lisam-Dilts-Rock outcrop, shale complex, 25 to 60 percent slopes*
81	Lisam-Hillon association, steep*
82	Lisam-Wabek association, steep*
83	Lolo loam
84	Macmeal association, steep*
85	Marmarth-Cabbart complex, 2 to 8 percent slopes
86	Martinsdale clay loam, 0 to 4 percent slopes
87	Martinsdale-Judith complex, 2 to 8 percent slopes
88	Marvan clay, 0 to 4 percent slopes
89	Marvan-Bascovy clays, 2 to 8 percent slopes
90	Nishon loam
91	Nishon clay loam
92	Norbert clay, 8 to 35 percent slopes
93	Norbert-Rock outcrop, shale complex, 25 to 60 percent slopes*
94	Perma-Castner-Belain complex, 25 to 60 percent slopes
95	Phillips loam, 0 to 4 percent slopes
96	Phillips loam, 4 to 8 percent slopes
97	Phillips-Elloam complex, 0 to 4 percent slopes
98	Phillips-Elloam complex, 4 to 8 percent slopes
99	Phillips-Kevin complex, 0 to 4 percent slopes
100	Phillips-Kevin complex, 4 to 8 percent slopes
101	Pits, gravel
102	Reeder loam, 2 to 4 percent slopes
103	Reeder loam, 4 to 8 percent slopes
104	Rubble land-Rock outcrop association*
105	Savage silty clay loam, 0 to 2 percent slopes
106	Savage silty clay loam, 2 to 4 percent slopes
107	Savage-Gerdrum silty clay loams, 0 to 4 percent slopes
108	Scobey clay loam, 0 to 4 percent slopes
109	Scobey-Kevin clay loams, 0 to 4 percent slopes
110	Scobey-Kevin clay loams, 4 to 8 percent slopes
111	Shaak loam, 0 to 4 percent slopes
112	Shaak-Gerdrum complex, 0 to 4 percent slopes
113	Shawmut gravelly loam, 0 to 4 percent slopes
114	Shawmut gravelly loam, 4 to 8 percent slopes
115	Silverchief-Whitecow-Macmeal association, steep*
116	Straw-Korent loams
117	Straw-Korent loams, occasionally flooded
118	Straw and Nesda soils, channeled*
119	Telstad loam, 0 to 4 percent slopes
120	Telstad-Joplin loams, 0 to 4 percent slopes
121	Telstad-Joplin loams 4 to 8 percent slopes
122	Telstad-Joplin gravelly loams, 0 to 4 percent slopes
123	Thoeny-Elloam complex, 0 to 4 percent slopes
124	Thoeny-Kevin-Elloam complex, 4 to 8 percent slopes
125	Turner loam, 0 to 4 percent slopes
126	Turner-Beaverton complex, 2 to 8 percent slopes
127	Twilight-Riedel fine sandy loams, 4 to 8 percent slopes
128	Twilight-Riedel fine sandy loams, 8 to 20 percent slopes
129	Typic Fluvaquents, 0 to 2 percent slopes
130	Typic Ustifluvents, wet*
131	Ustic Torrifluvents, wet*
132	Vanda clay, 0 to 2 percent slopes
133	Vanda-Nobe clays, 0 to 2 percent slopes
134	Vanda-Nobe clays, 2 to 8 percent slopes
135	Vida clay loam, 4 to 8 percent slopes
136	Vida-Zahill clay loams, 8 to 15 percent slopes
137	Wabek gravelly loam, 8 to 35 percent slopes
138	Warneke-Whitecow-Rock outcrop complex, 35 to 70 percent slopes*
139	Whitecow-Warneke gravelly loams, 25 to 60 percent slopes*
140	Whitecow association, steep*
141	Williams loam, 0 to 4 percent slopes
142	Williams-Vida loams, 0 to 4 percent slopes
143	Williams-Vida loams, 4 to 8 percent slopes
144	Windham cobbly loam, 15 to 45 percent slopes
145	Work clay loam, 0 to 4 percent slopes
146	Work clay loam, 4 to 8 percent slopes
147	Yamac loam, 2 to 4 percent slopes
148	Yamac-Benz loams, 0 to 4 percent slopes
149	Yamac-Wabek association, moderately steep*
150	Zahill clay loam, 25 to 45 percent slopes
151	Zahill-Vida clay loams, 15 to 35 percent slopes

CONVENTIONAL AND SPECIAL
SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state or province

County or parish

Minor civil division

Reservation (national forest or park,
state forest or park,
and large airport)

Land grant

Limit of soil survey (label)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield,
cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS
(sections and land grants)

ROADS

Divided (median shown
if scale permits)

Other roads

Trail

ROAD EMBLEMS & DESIGNATIONS

Interstate

Federal

State

County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE
(normally not shown)

PIPE LINE
(normally not shown)

FENCE
(normally not shown)

LEVEES

Without road

With road

With railroad

DAMS

Large (to scale)

Medium or small

PITS

Gravel pit

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house
(omit in urban areas)

Church

School

Indian mound (label)

Located object (label)

Tank (label)

Wells, oil or gas

Windmill

Kitchen midden

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

Canals or ditches

Double-line (label)

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial

Intermittent

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Spring

Well, artesian

Well, irrigation

Wet spot

SPECIAL SYMBOLS FOR
SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

Bedrock
(points down slope)

Other than bedrock
(points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE
(normally not shown)

MISCELLANEOUS

Blowout

Clay spot

Gravelly spot

Gumbo, slick or scabby spot (sodic)

Dumps and other similar
non soil areas

Prominent hill or peak

Rock outcrop
(includes sandstone and shale)

Saline spot

Sandy spot

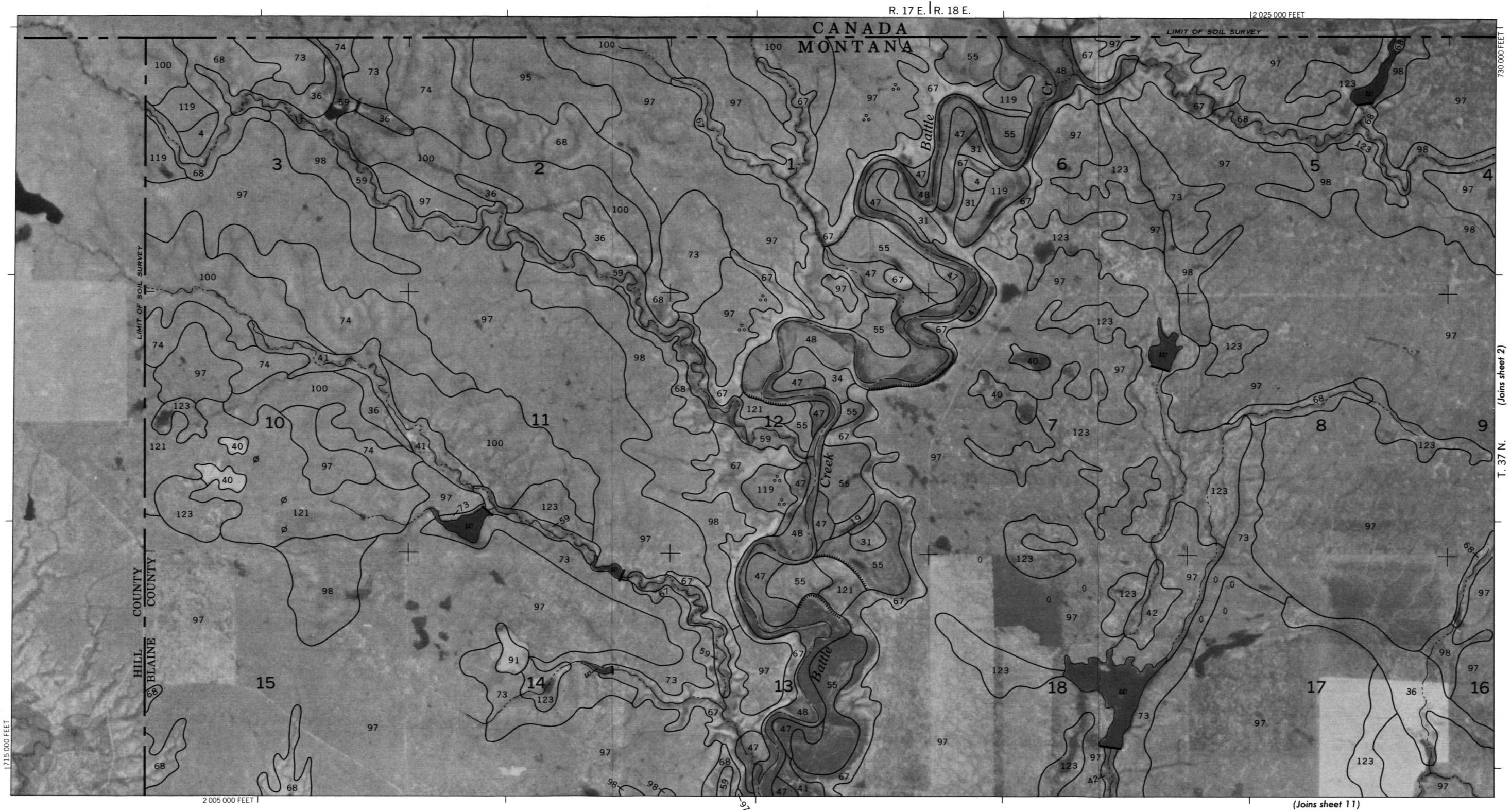
Severely eroded spot

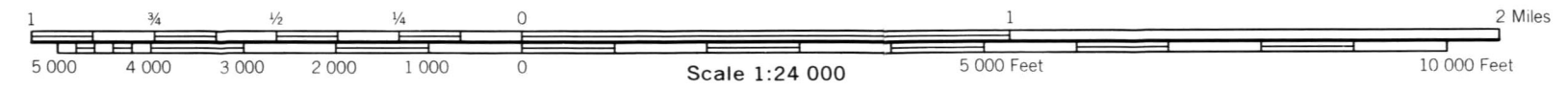
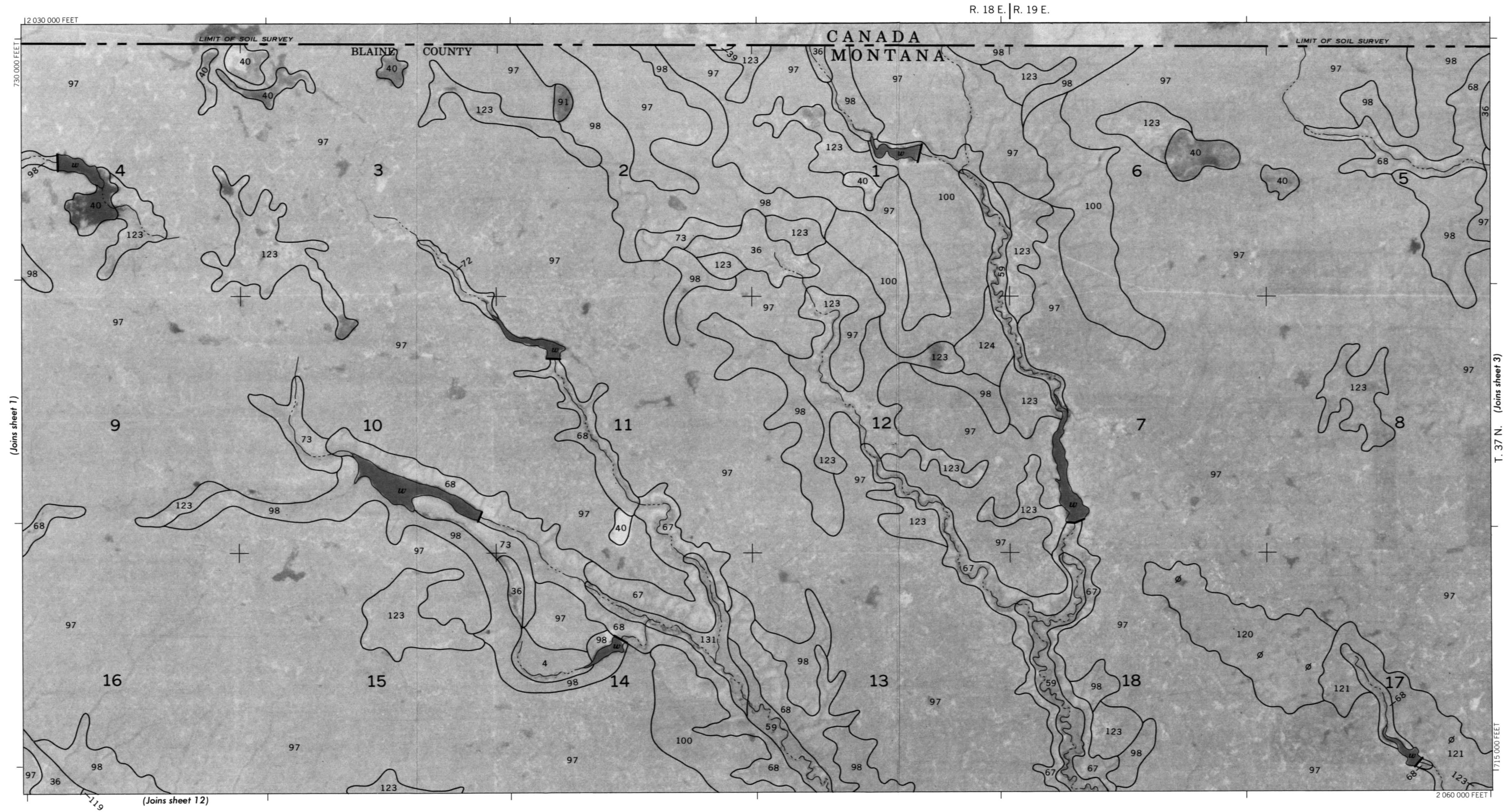
Slide or slip (tips point upslope)

Stony spot, very stony spot

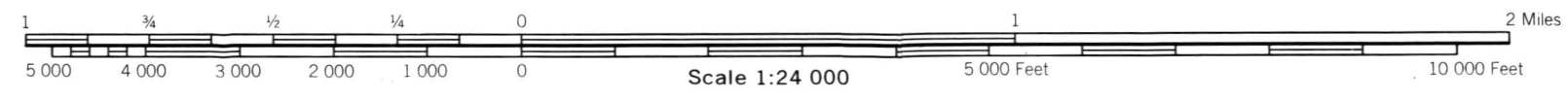
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



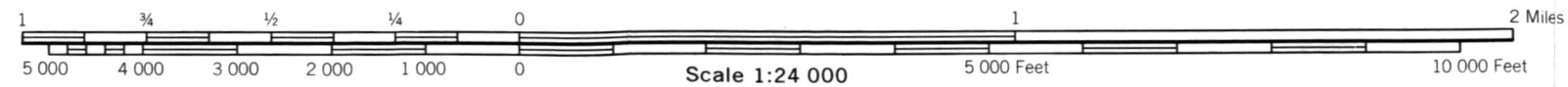


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

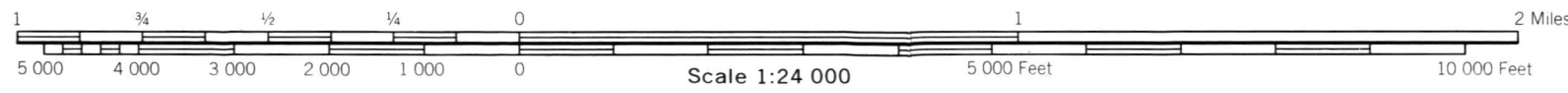


Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

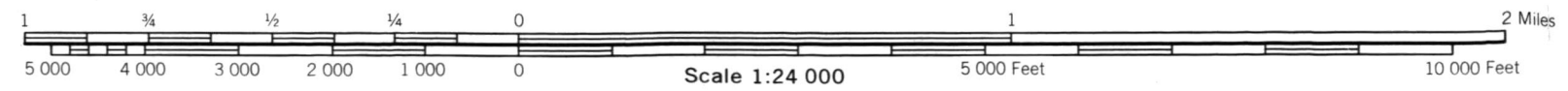
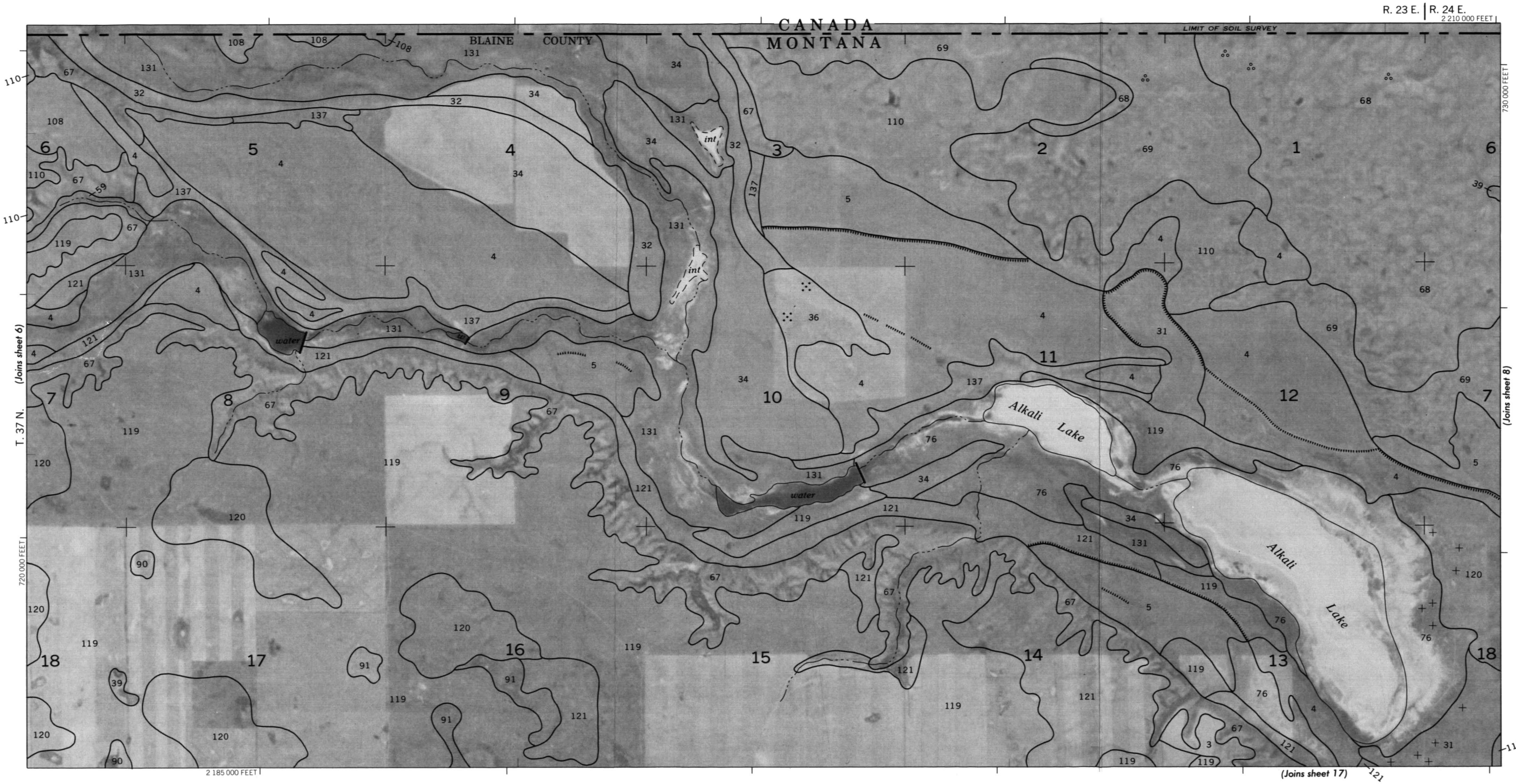
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

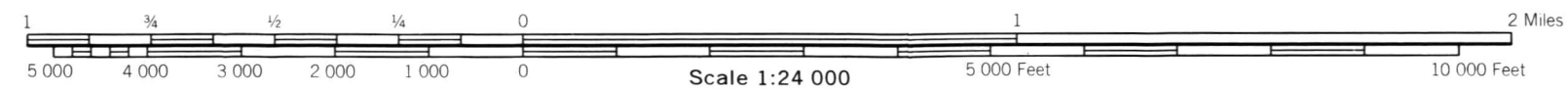
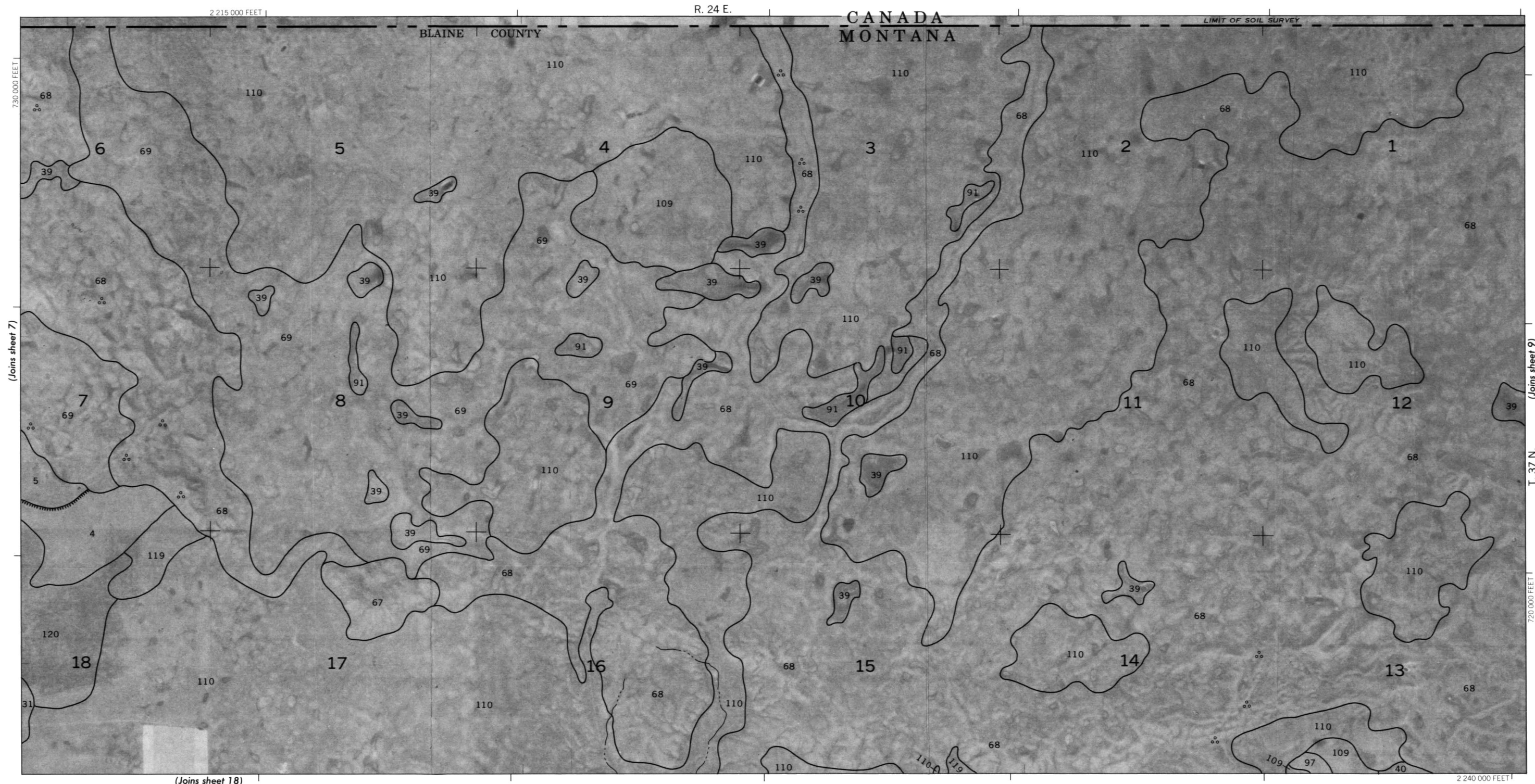


Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 7

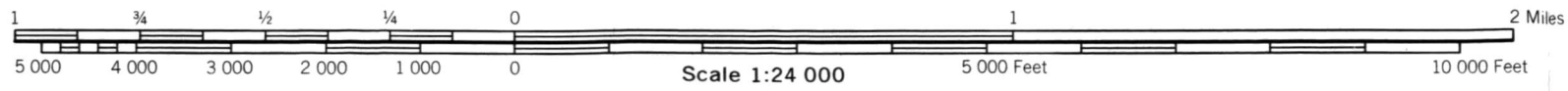
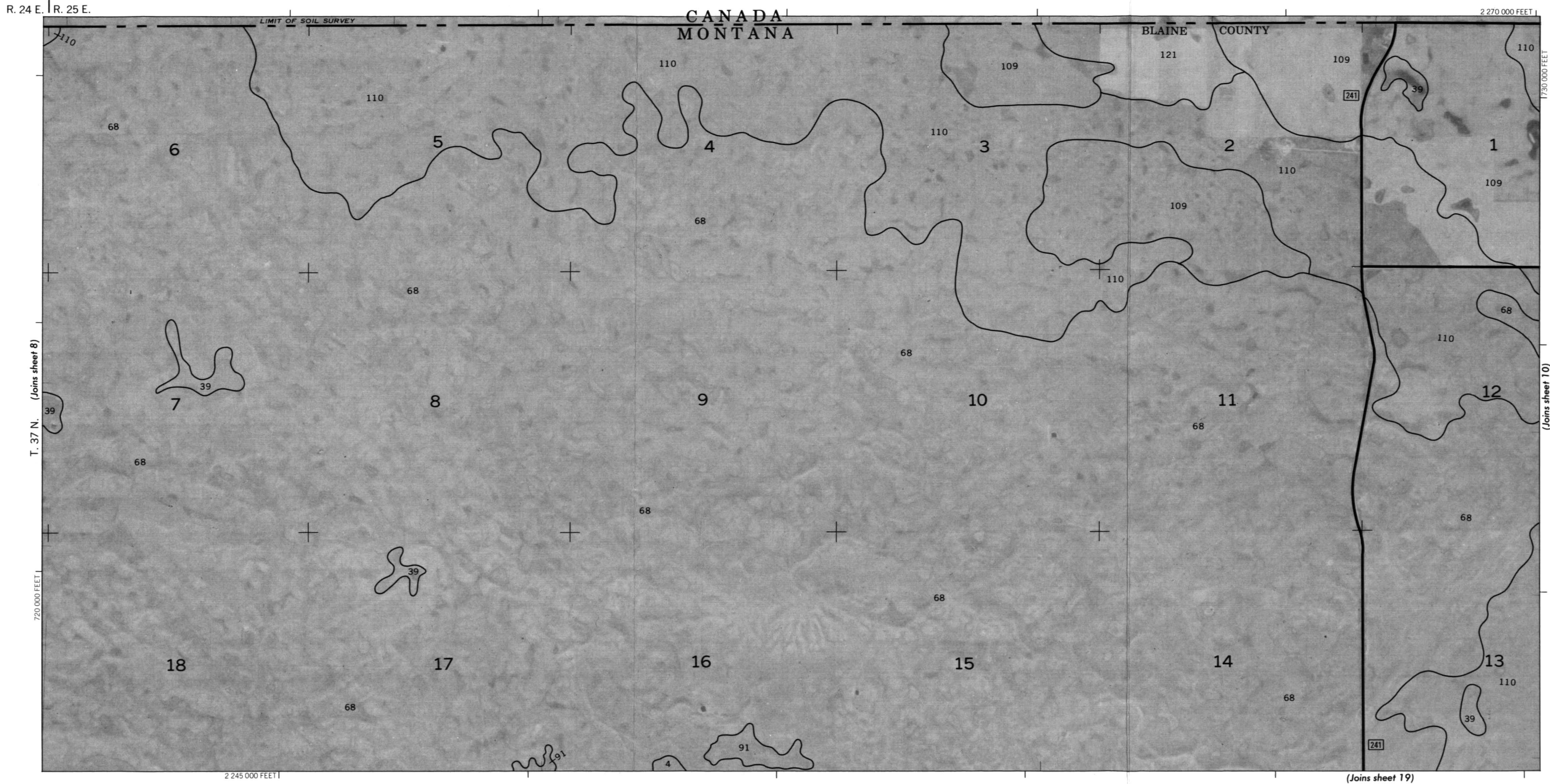
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

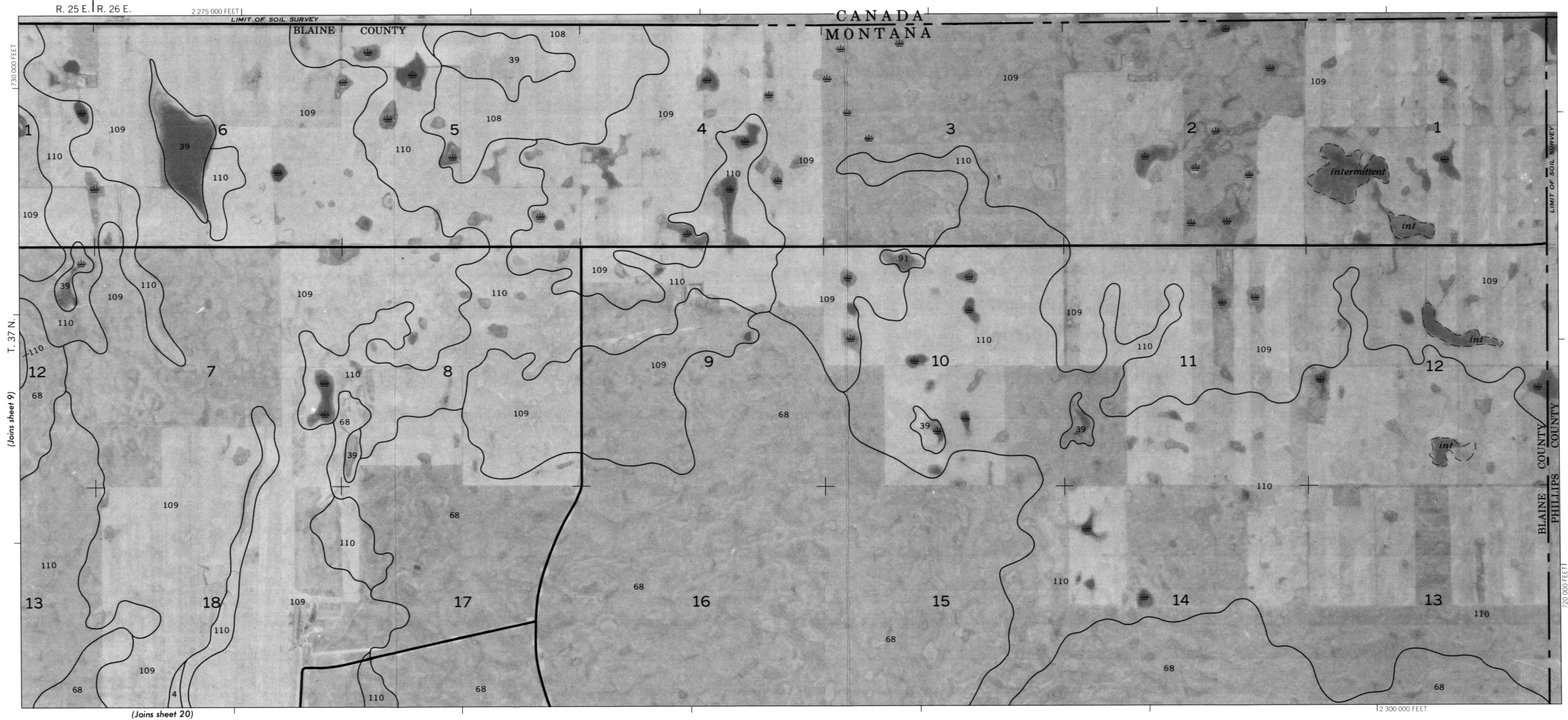


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 9

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



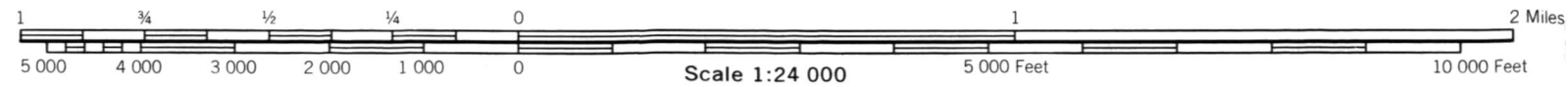
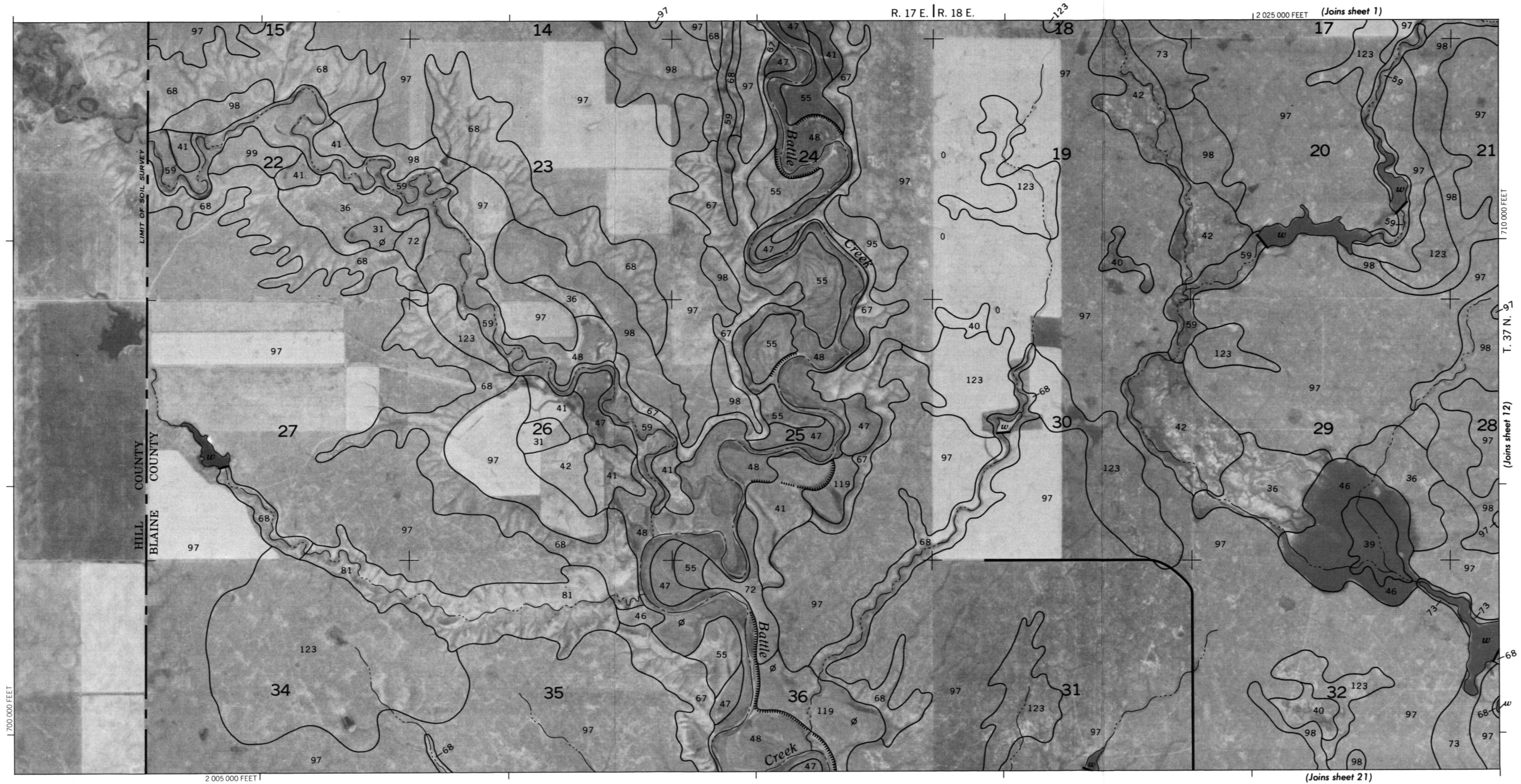


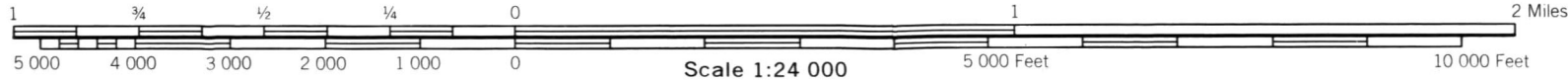
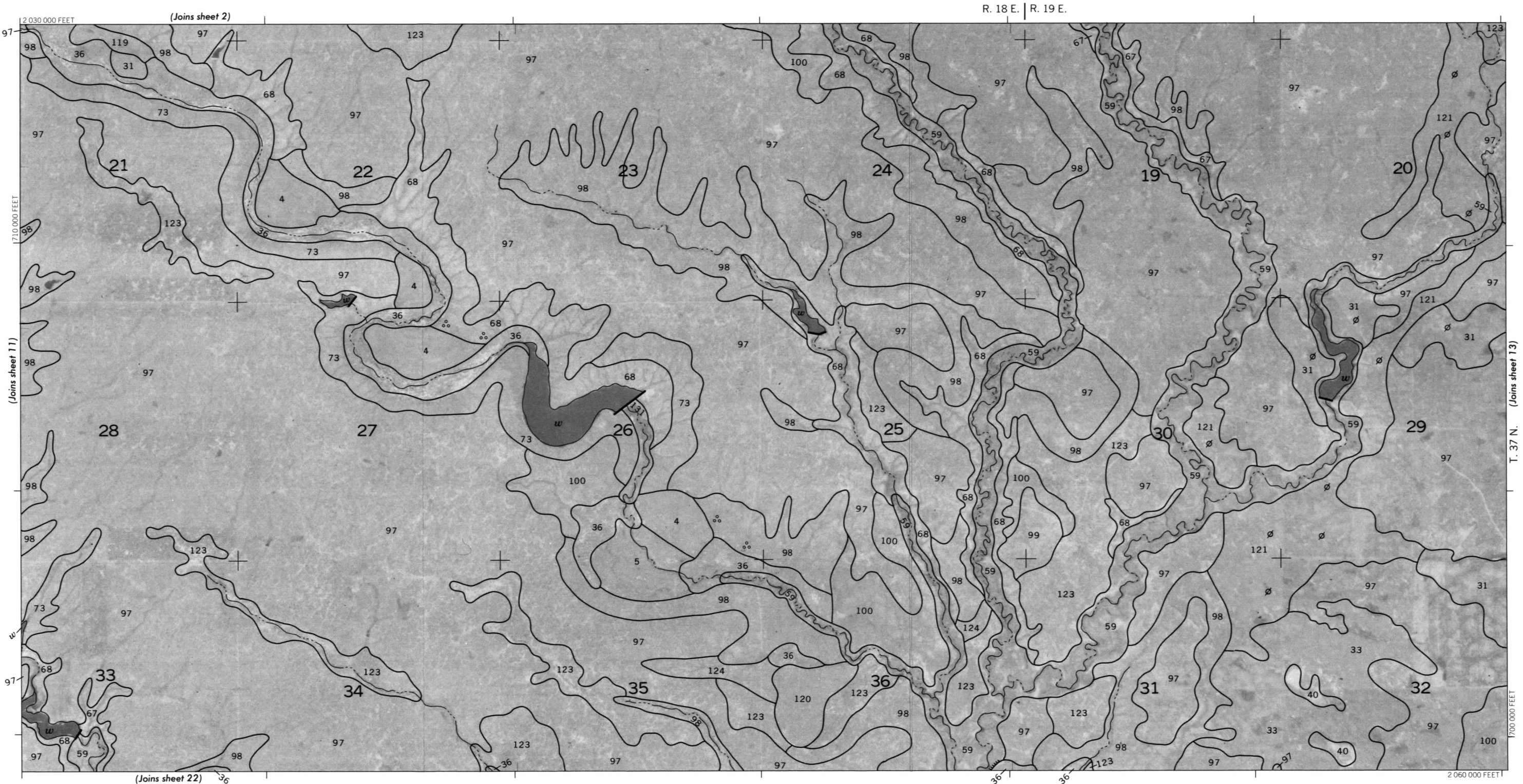
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 11

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



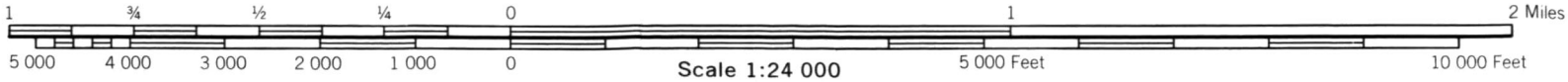
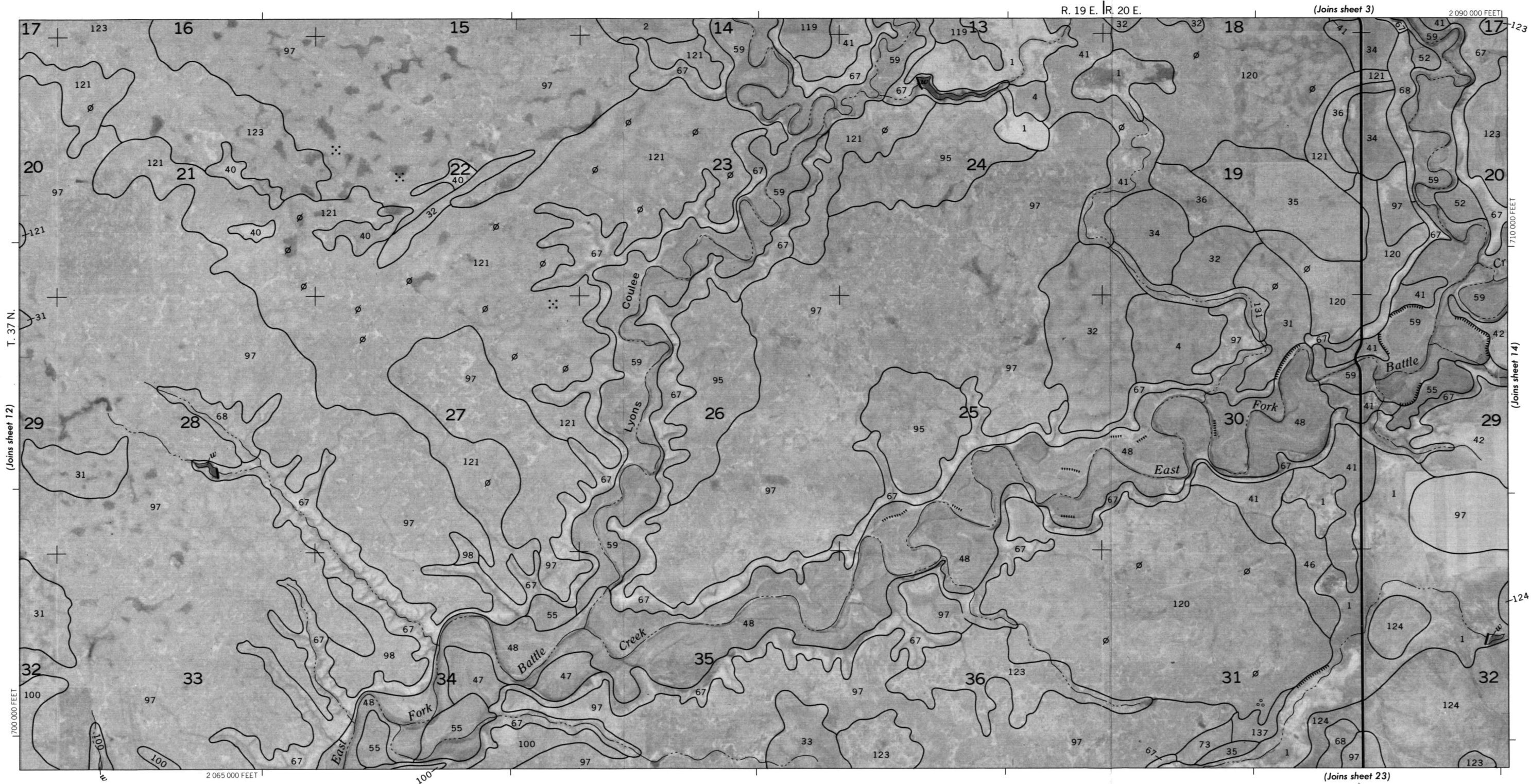


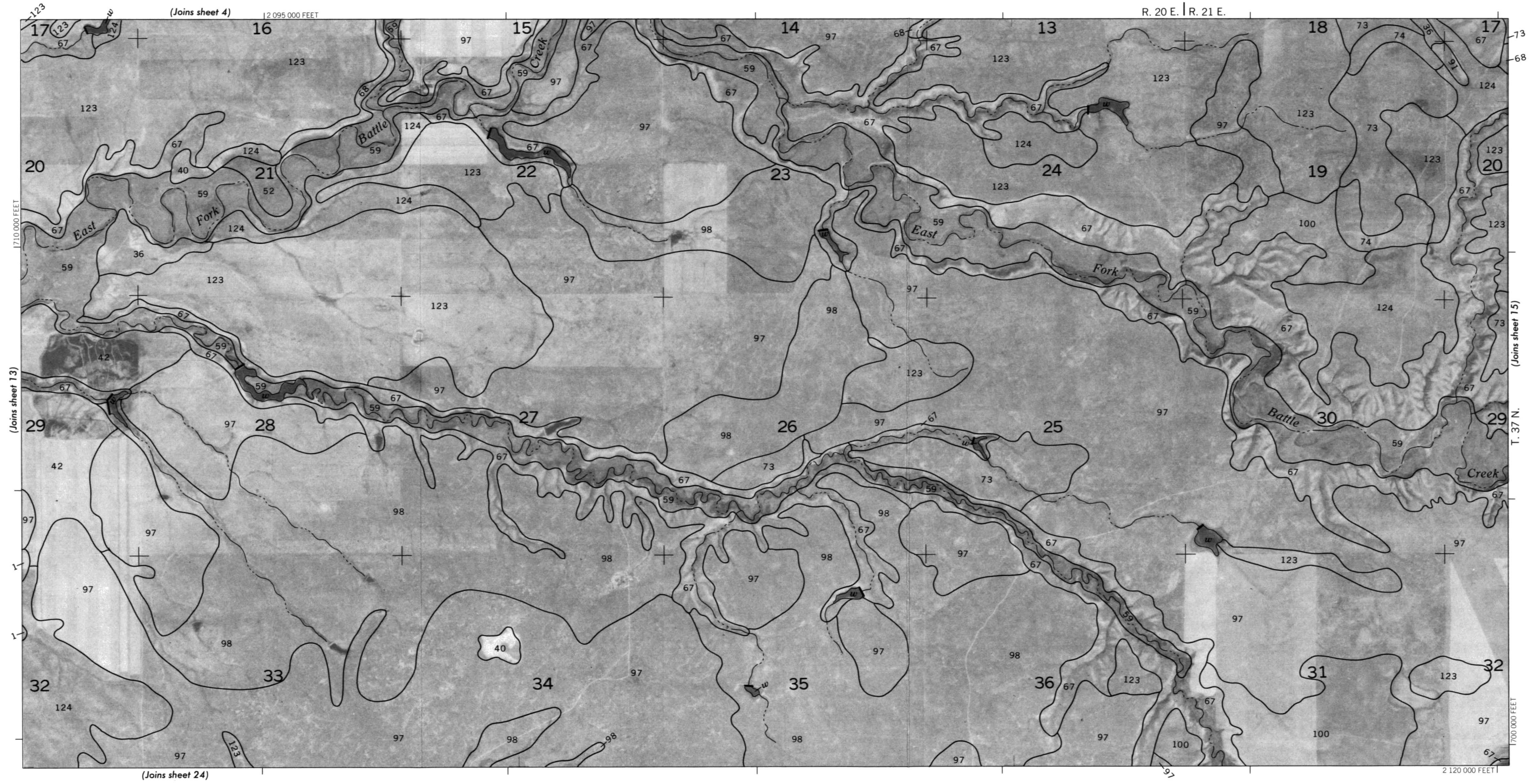
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



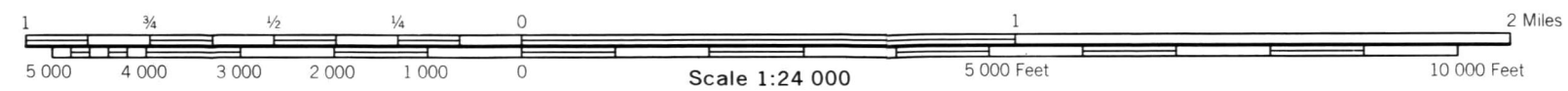
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 13

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



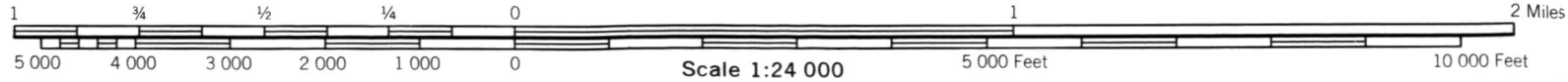
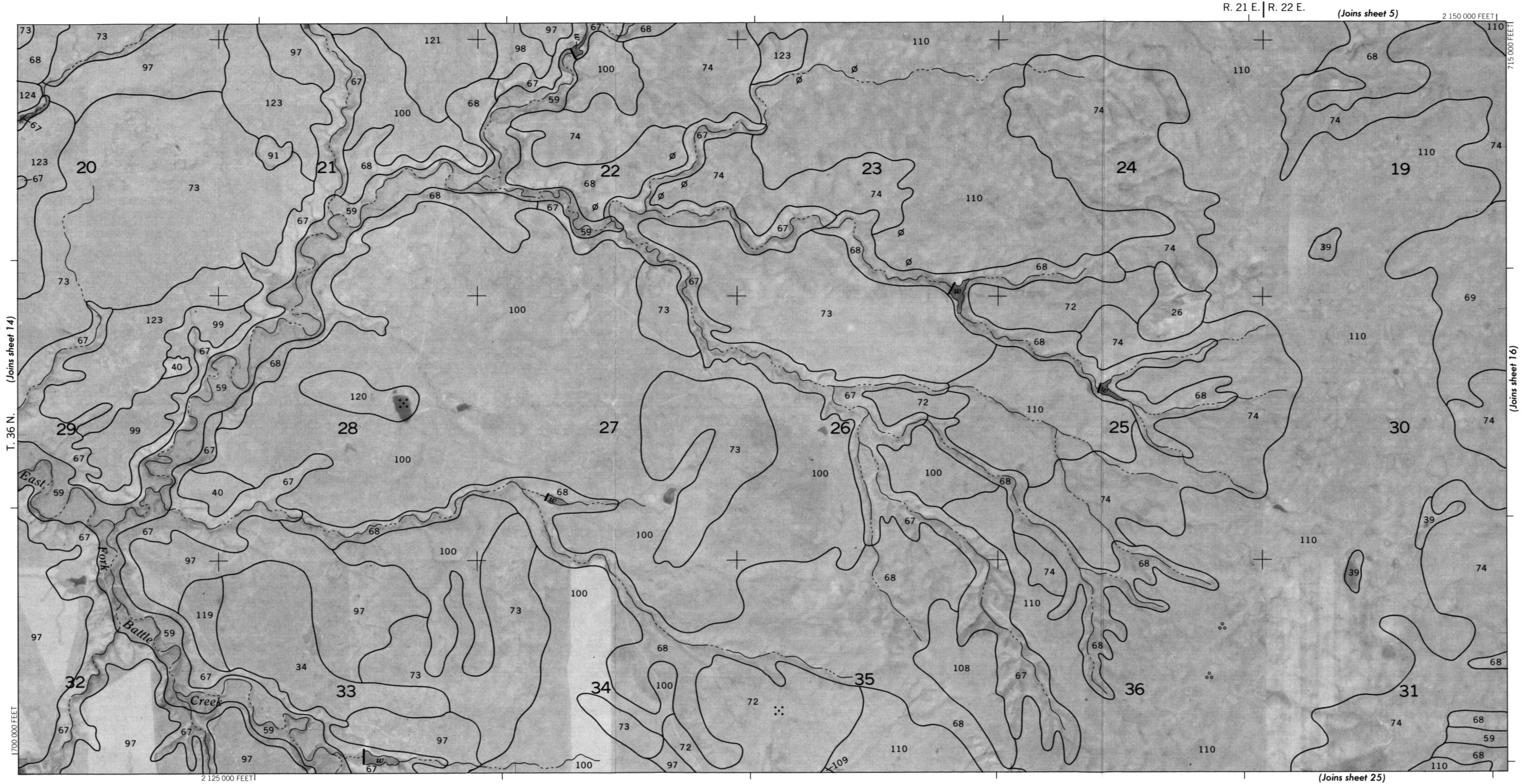


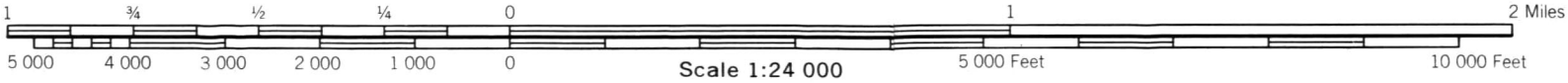
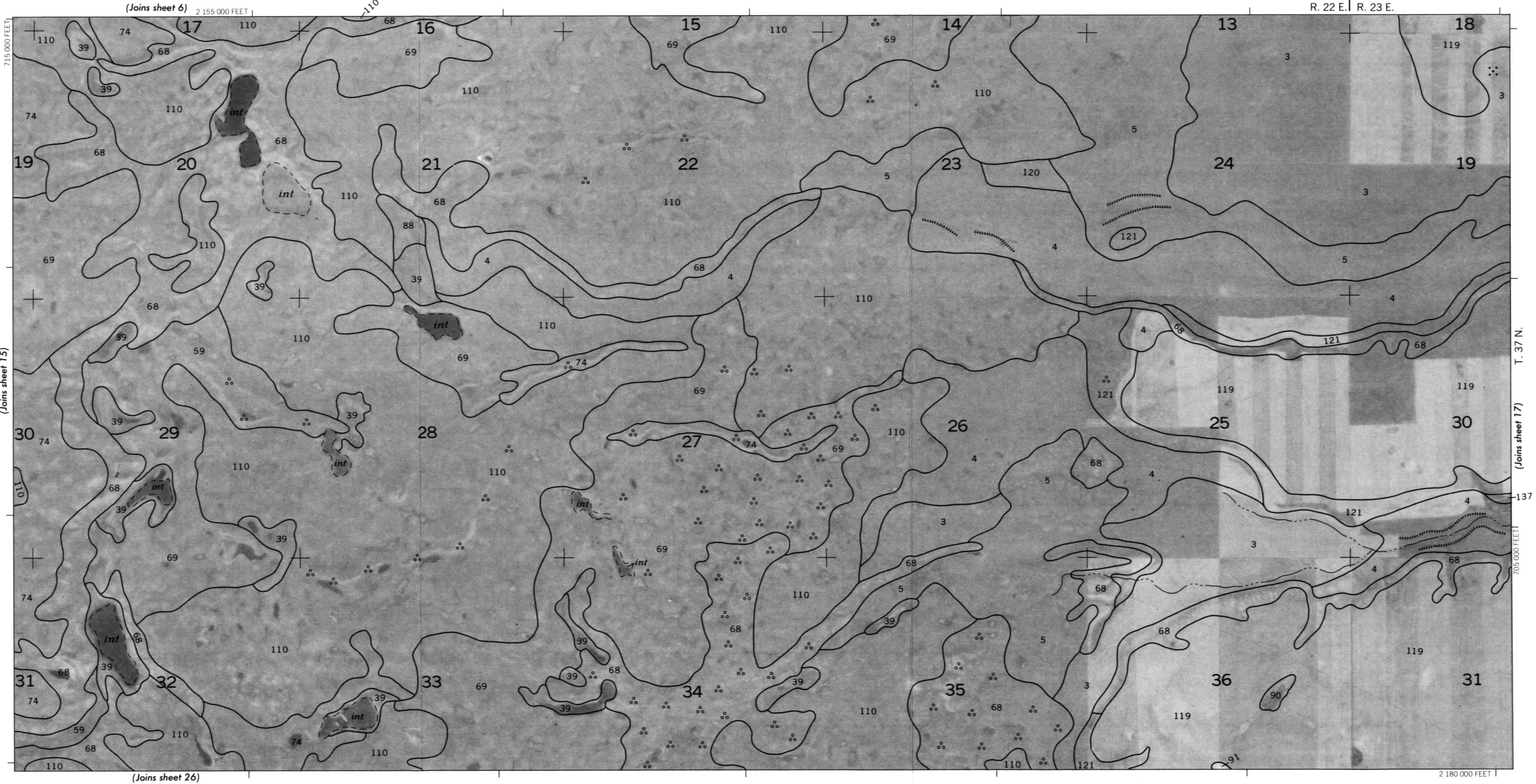
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 15

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

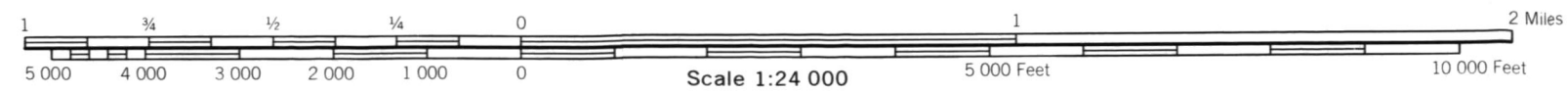
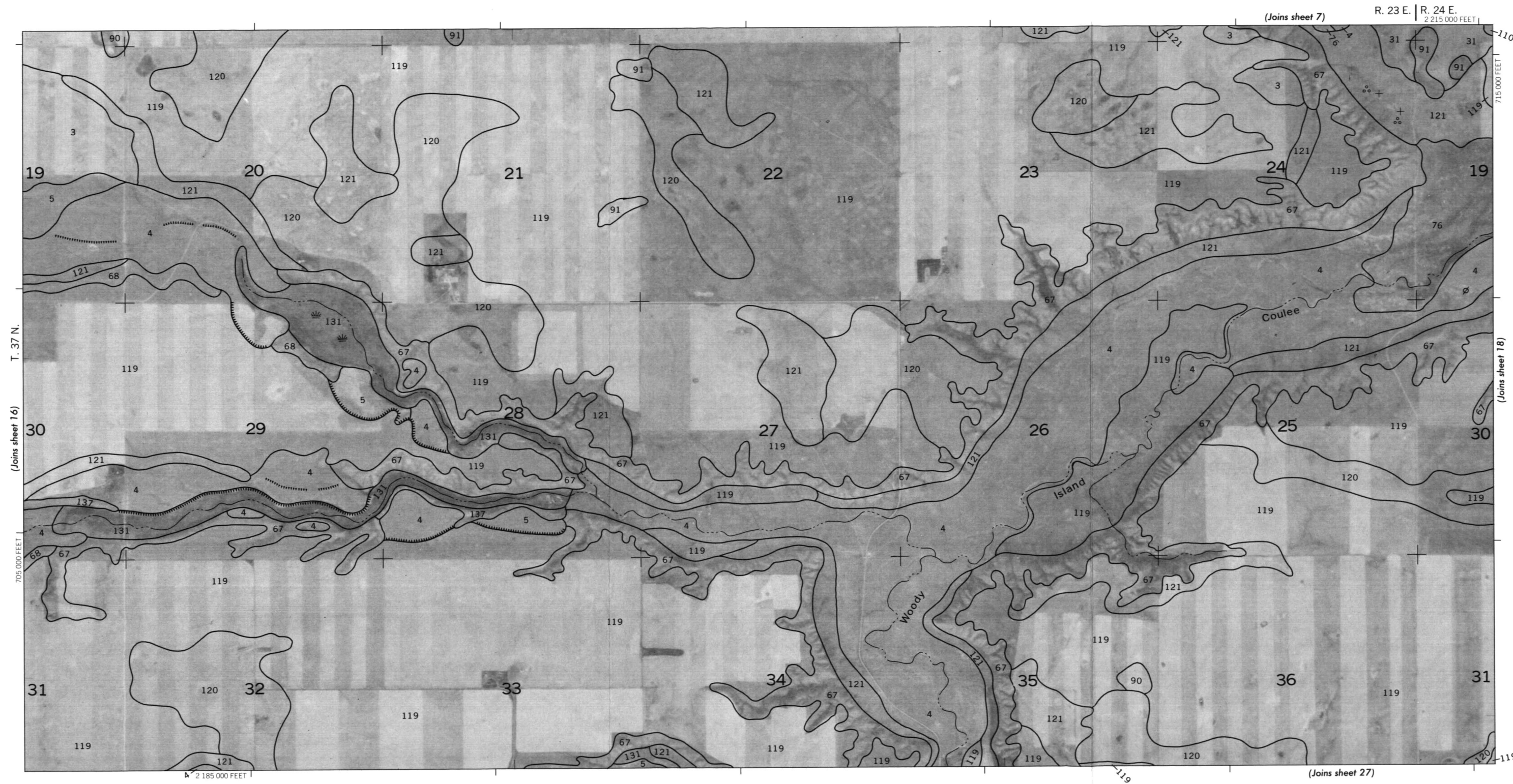




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

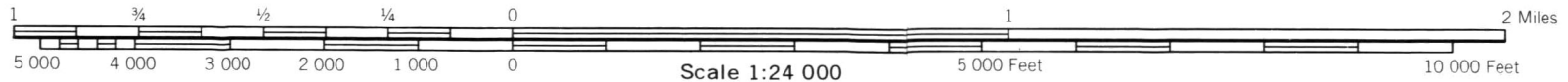
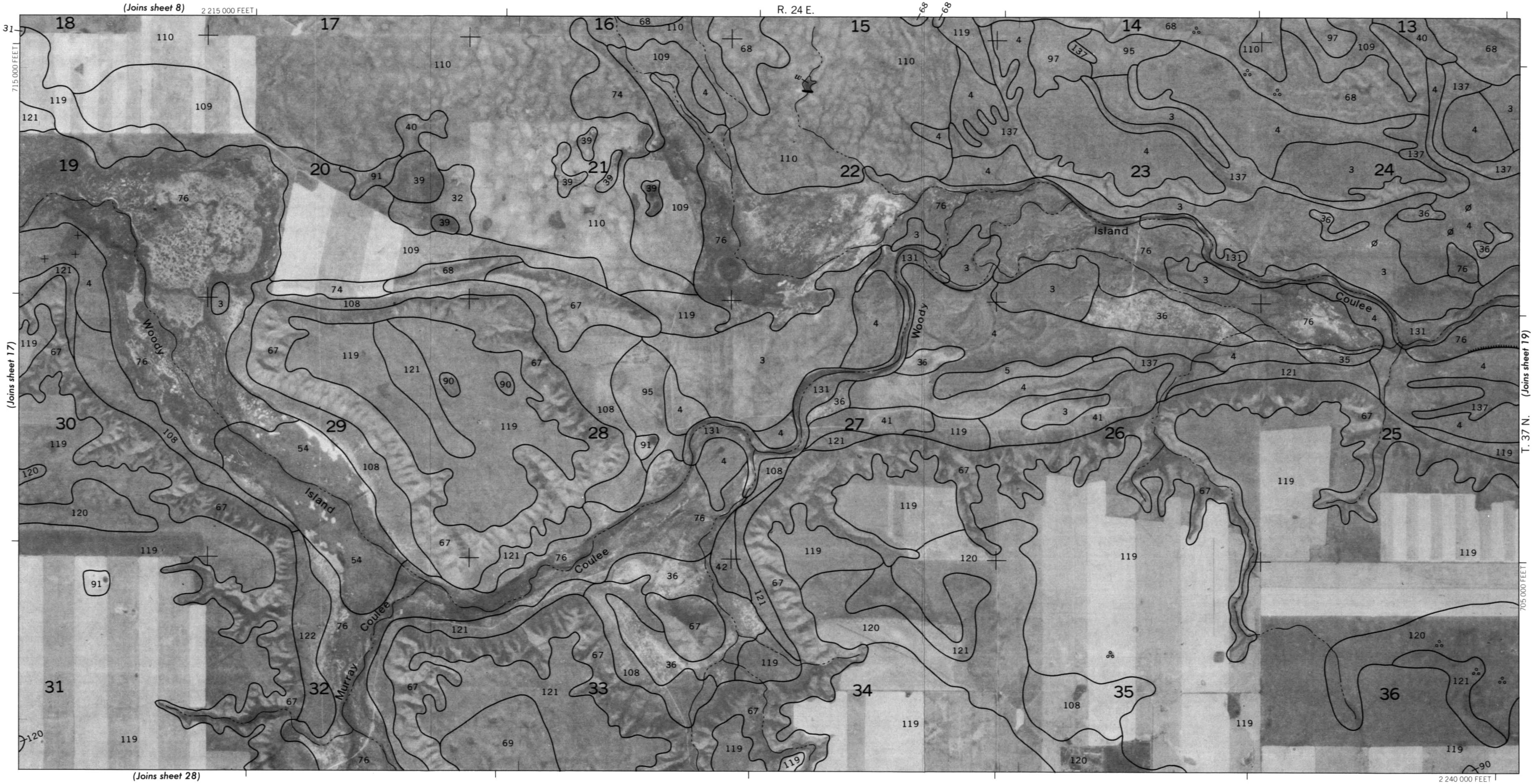
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 17

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

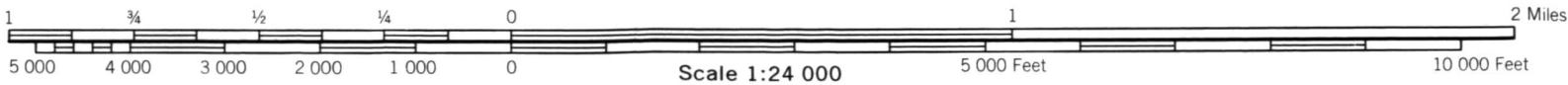
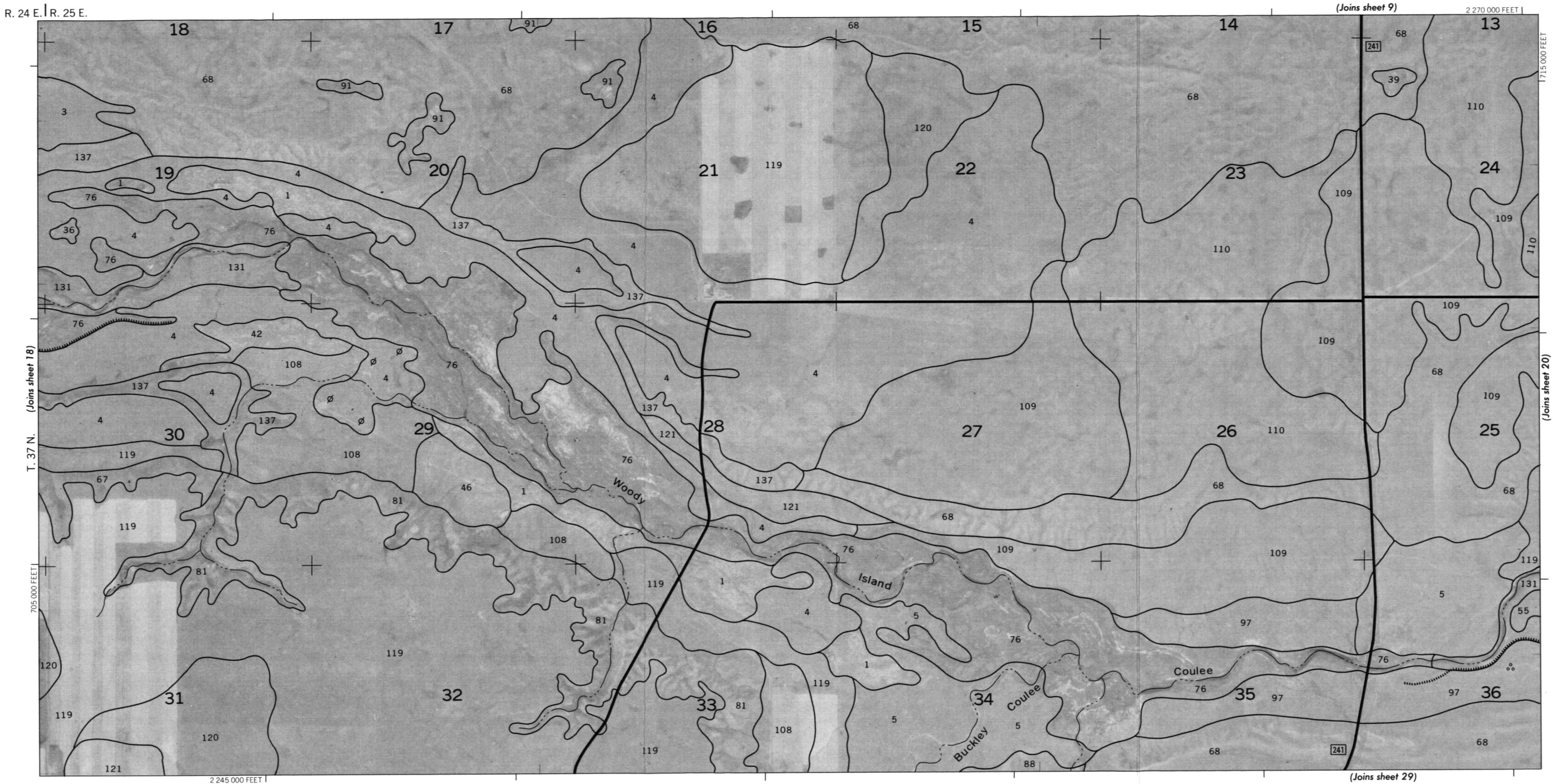




SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 18

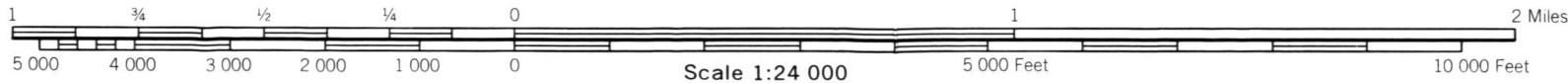
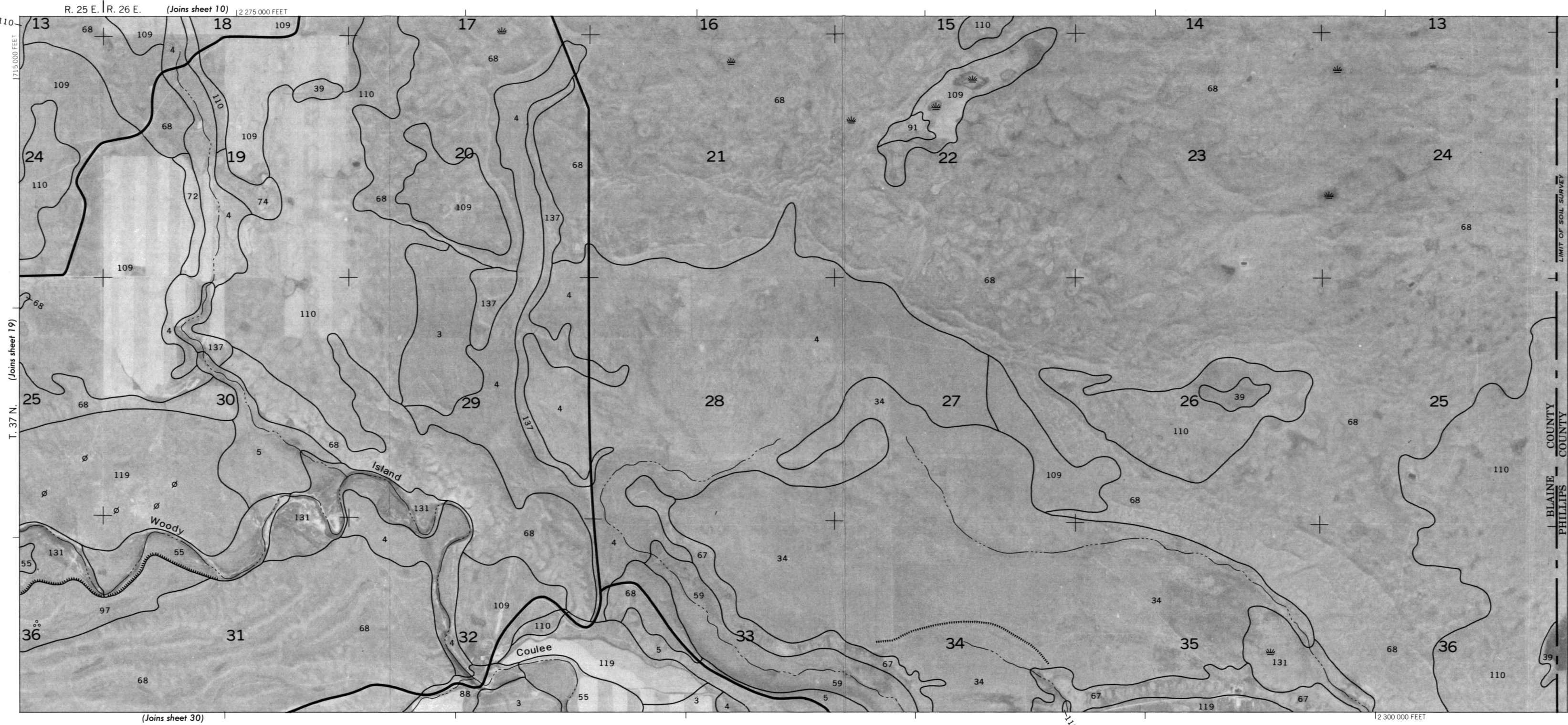


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 19

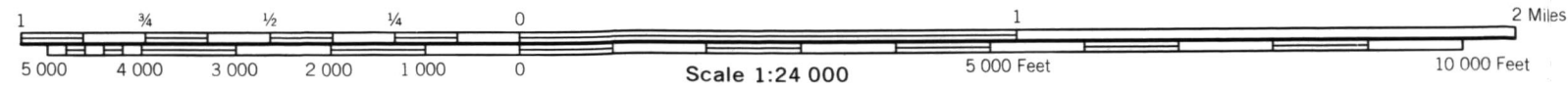
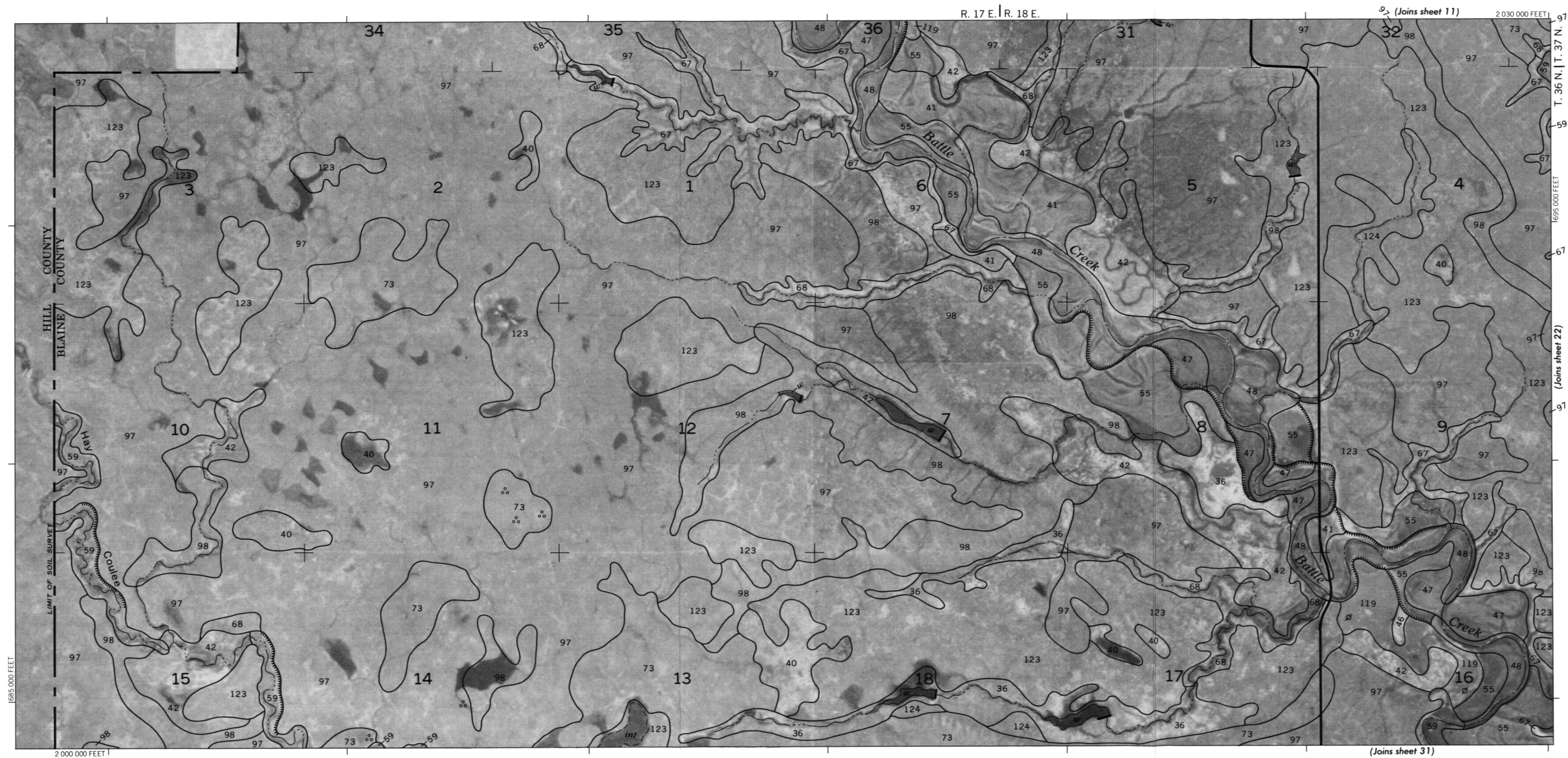
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

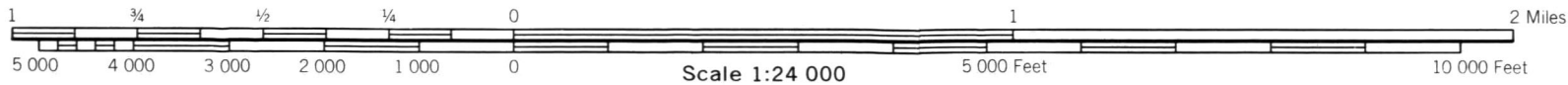
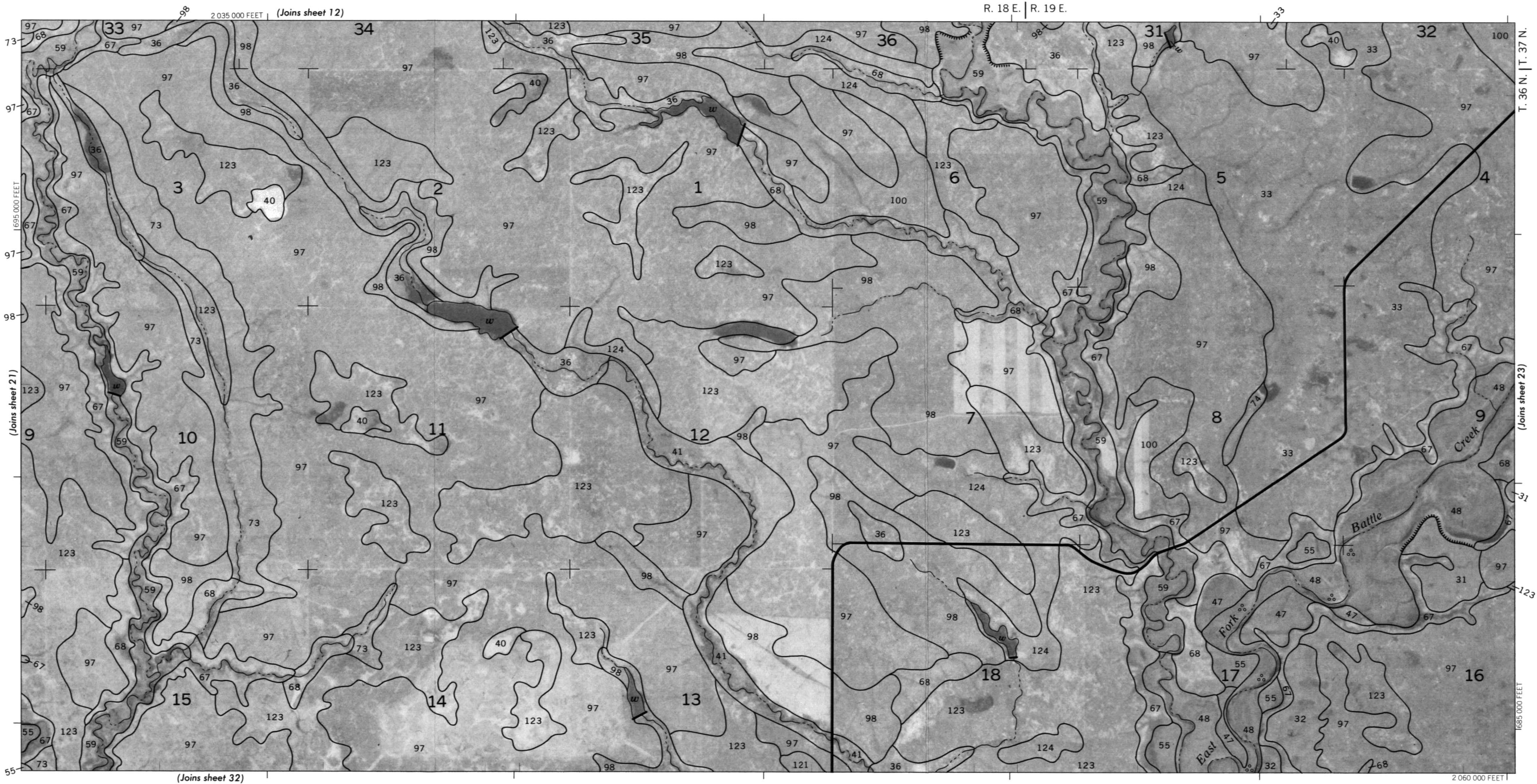


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 21

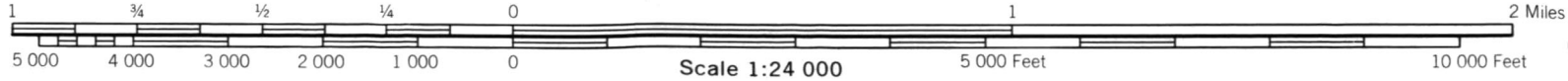
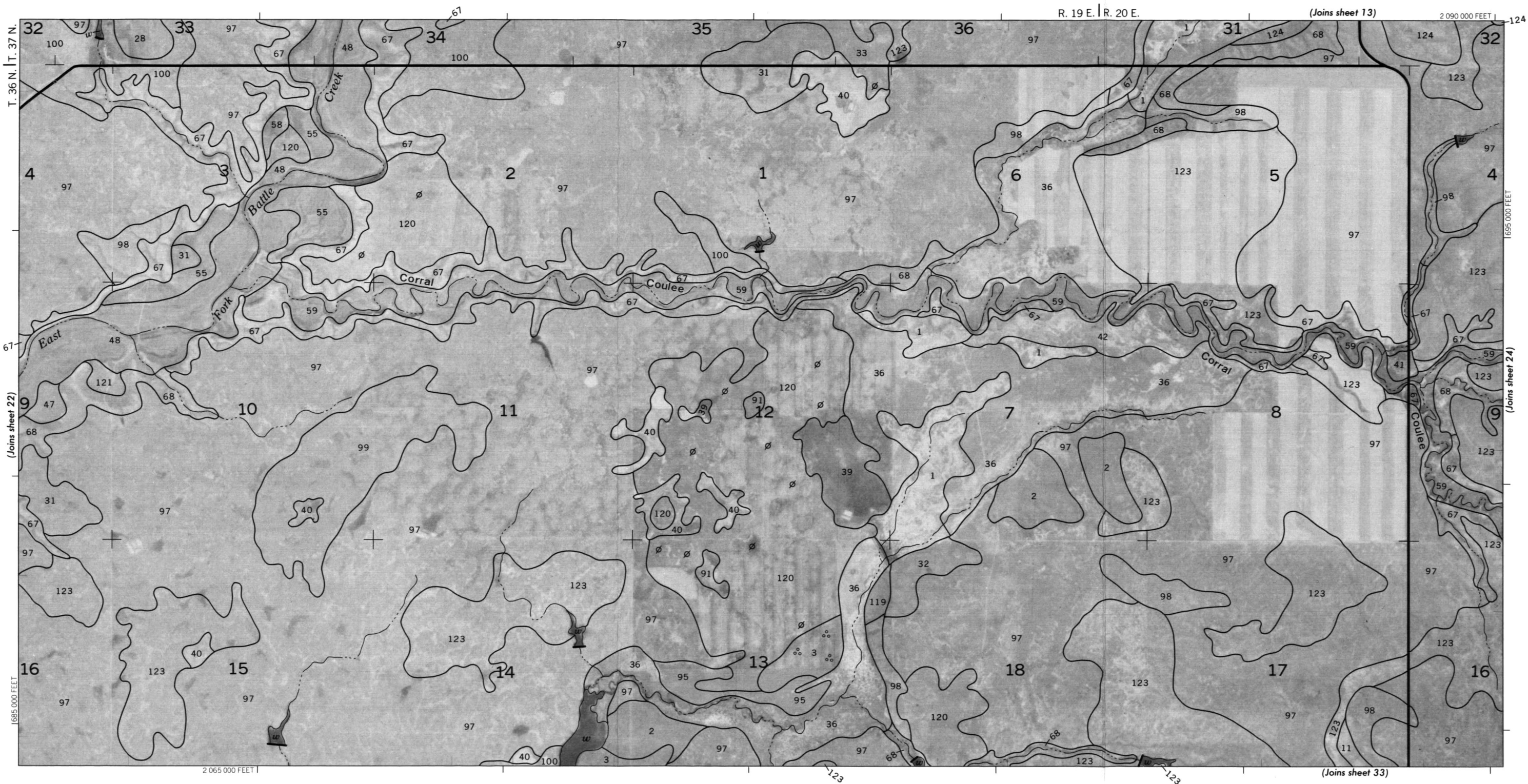


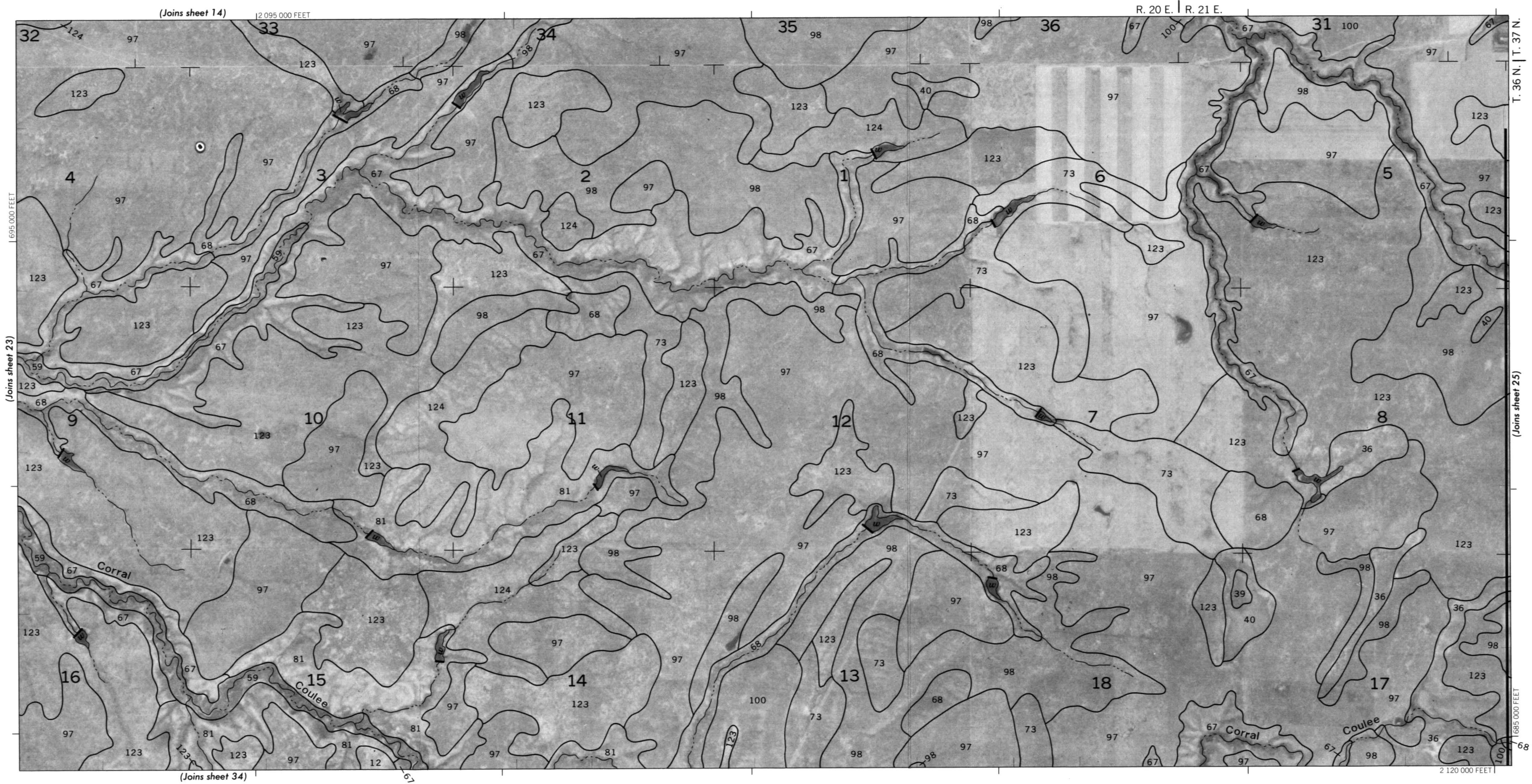


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 23

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

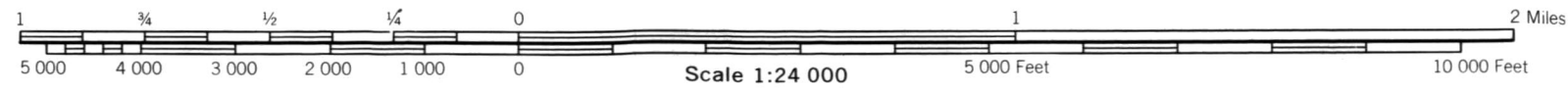
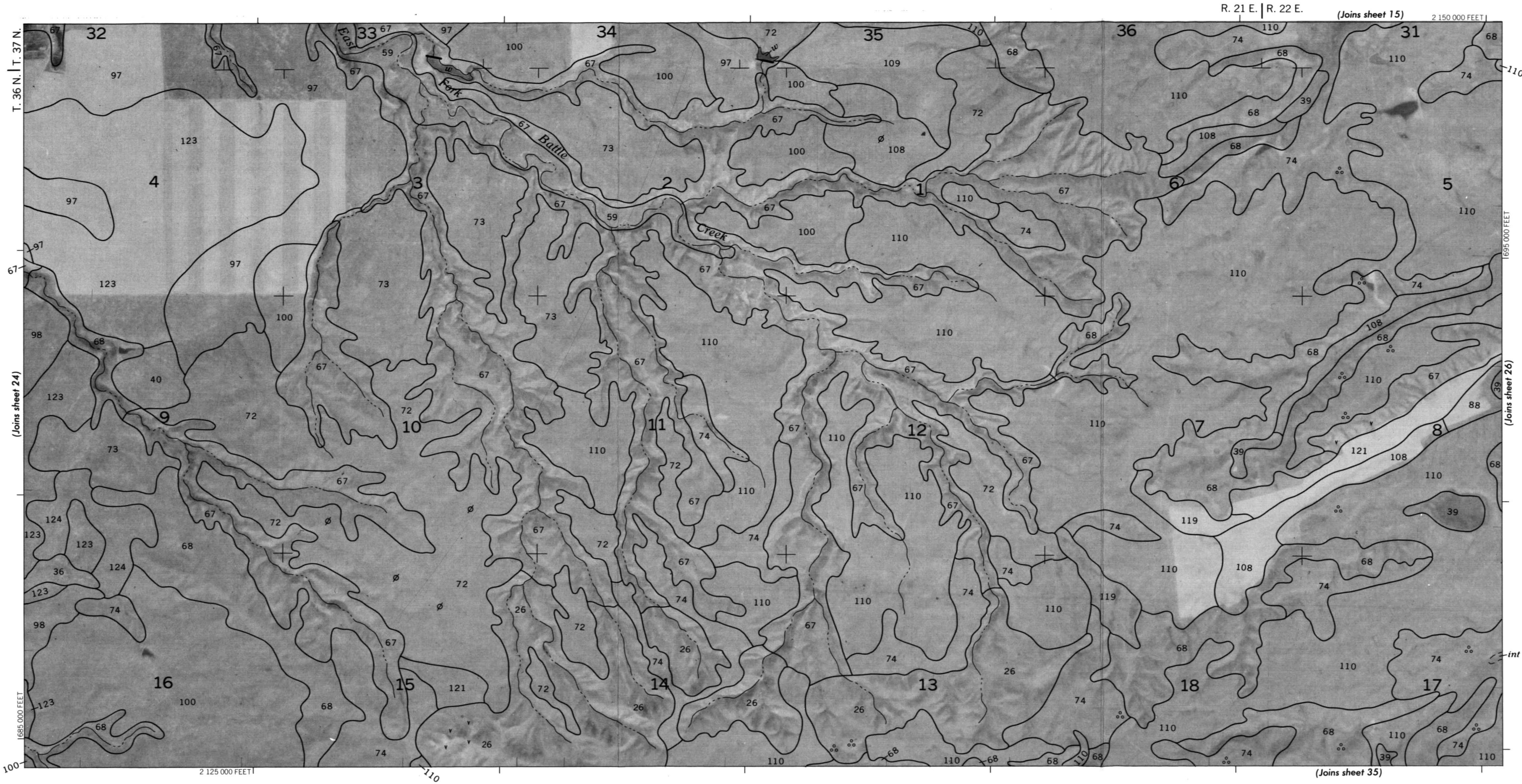




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 25

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

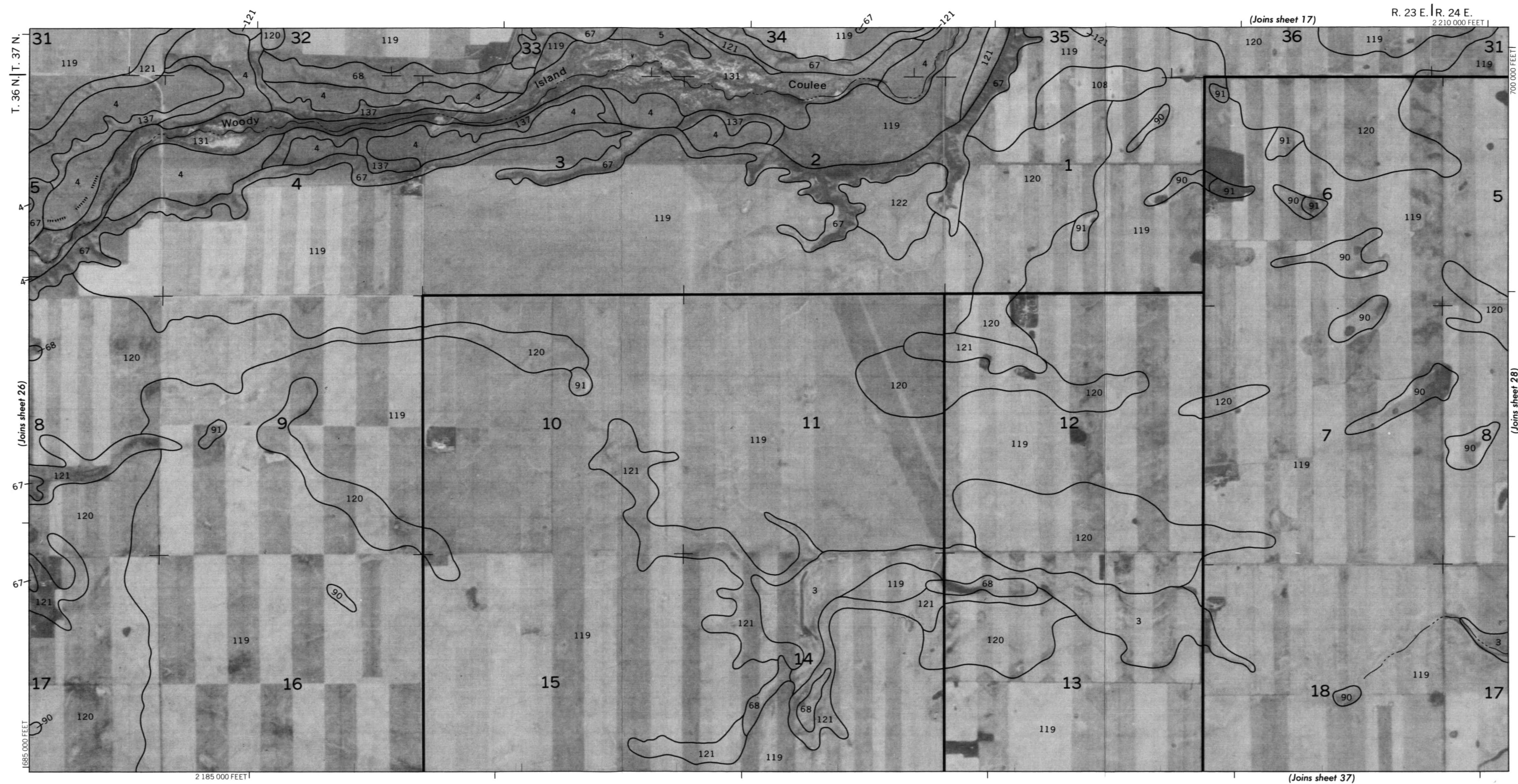


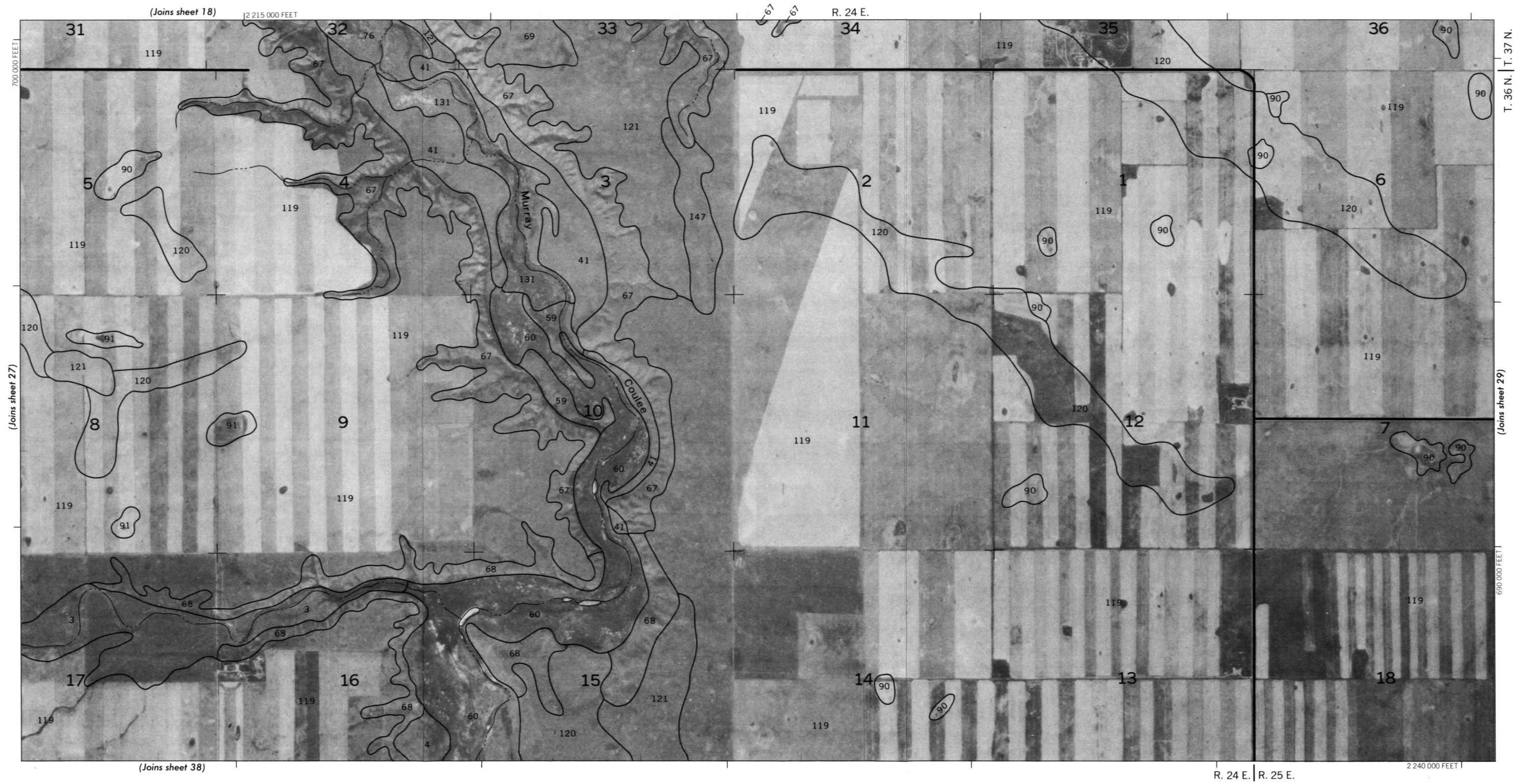


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 27

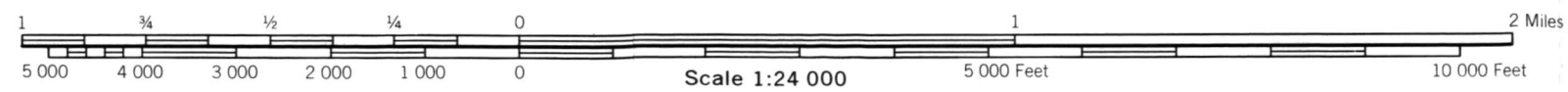
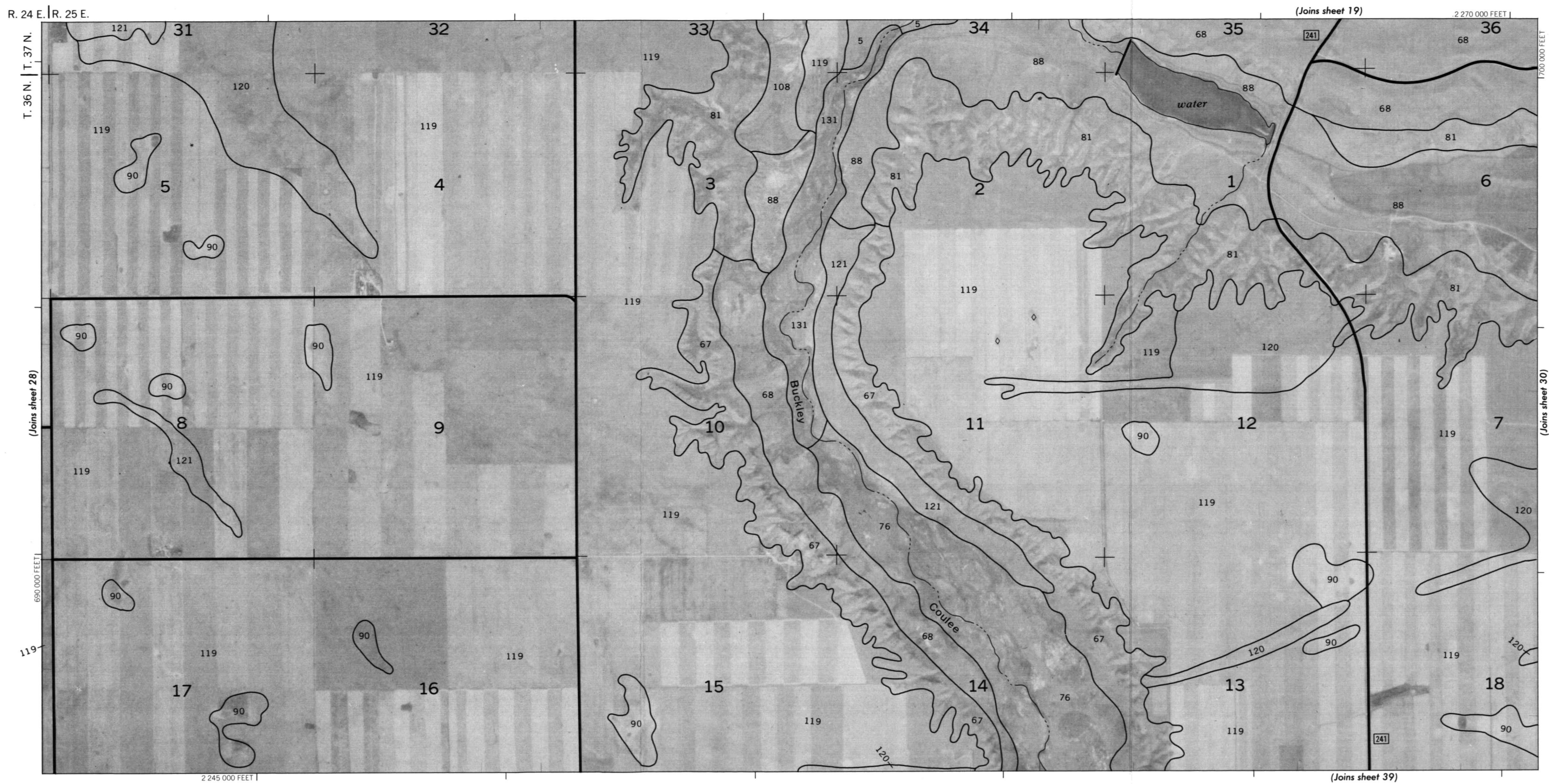
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

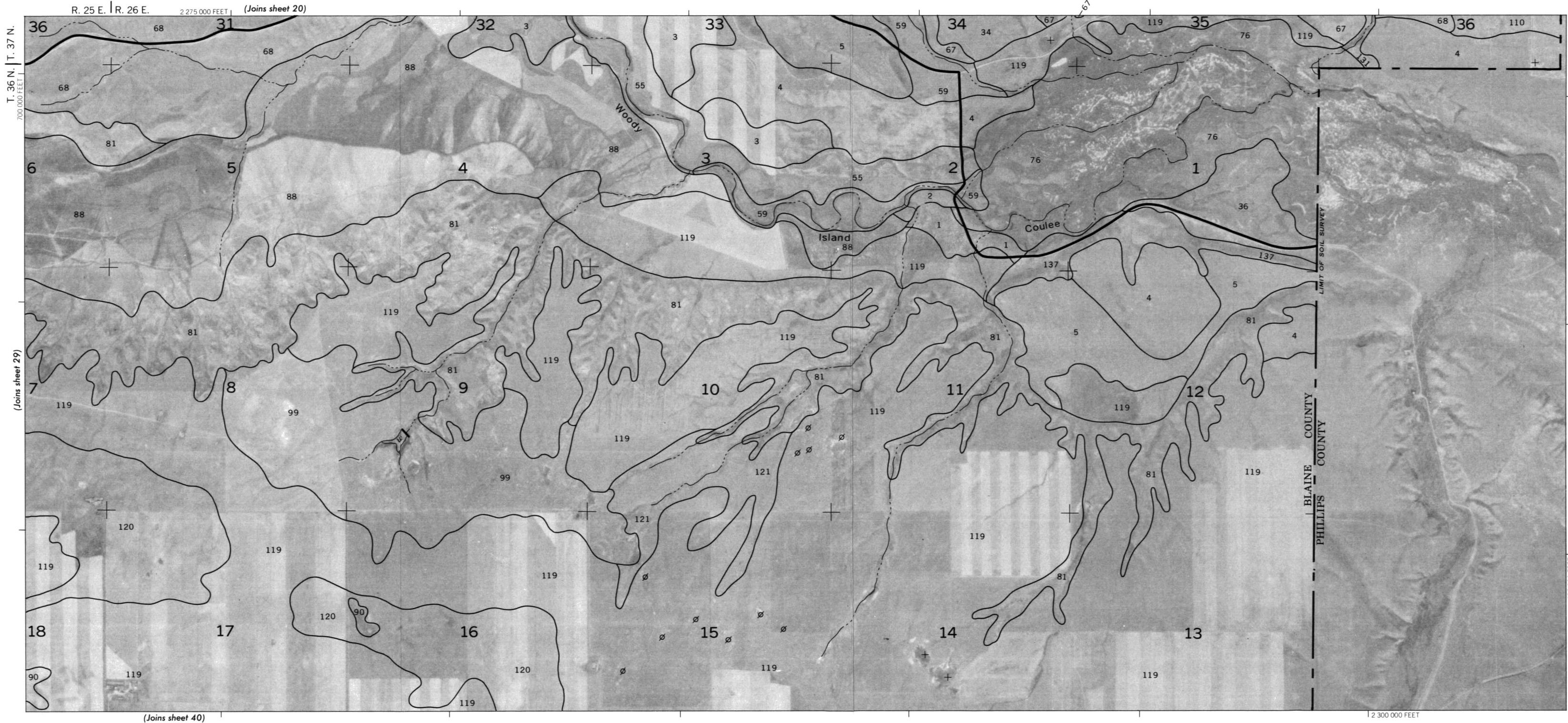




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

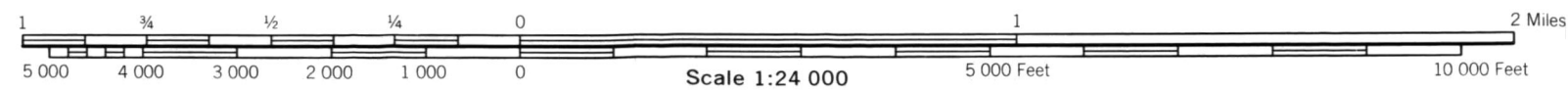
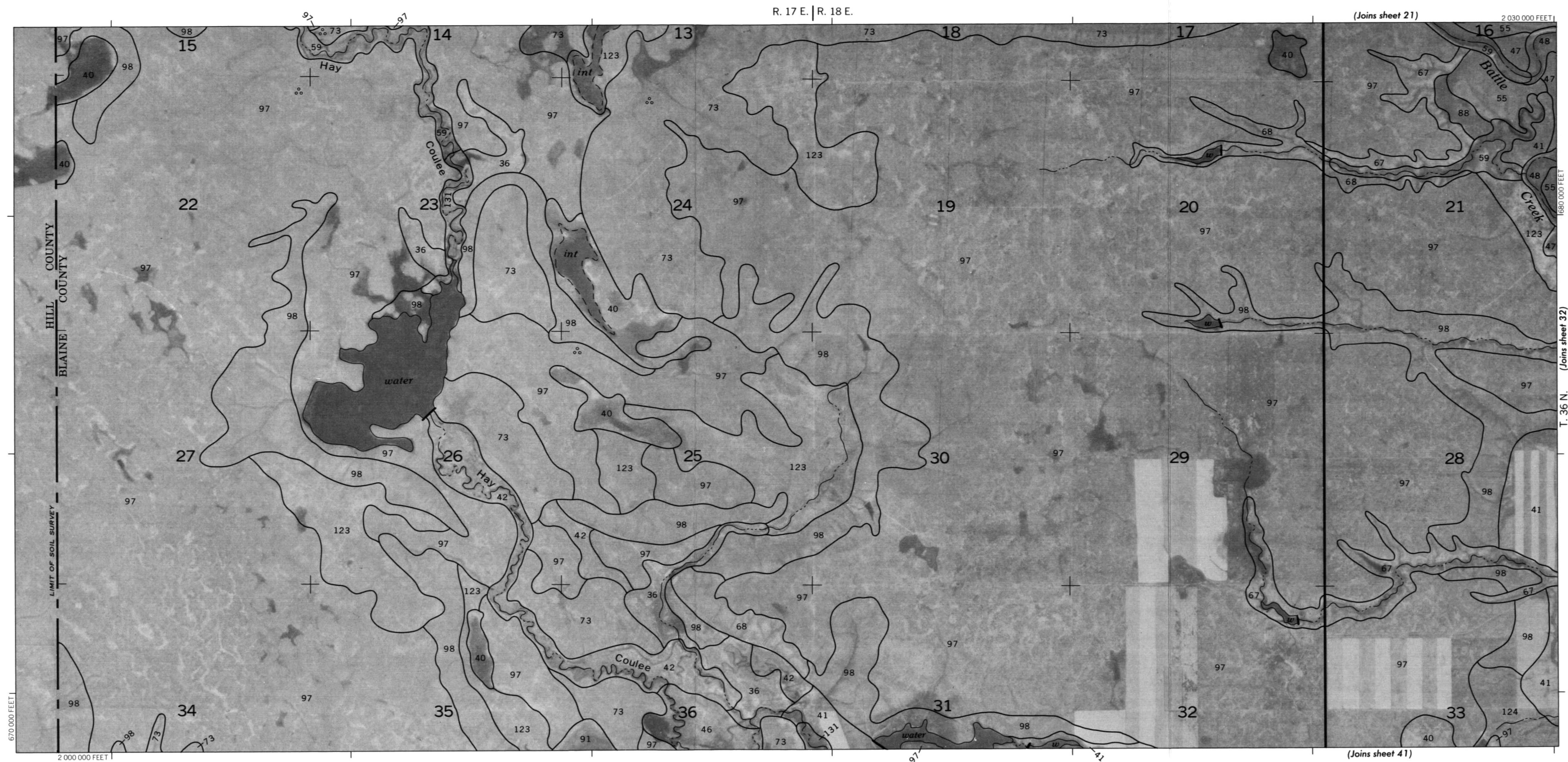


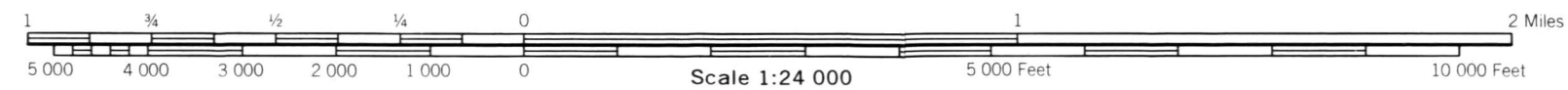
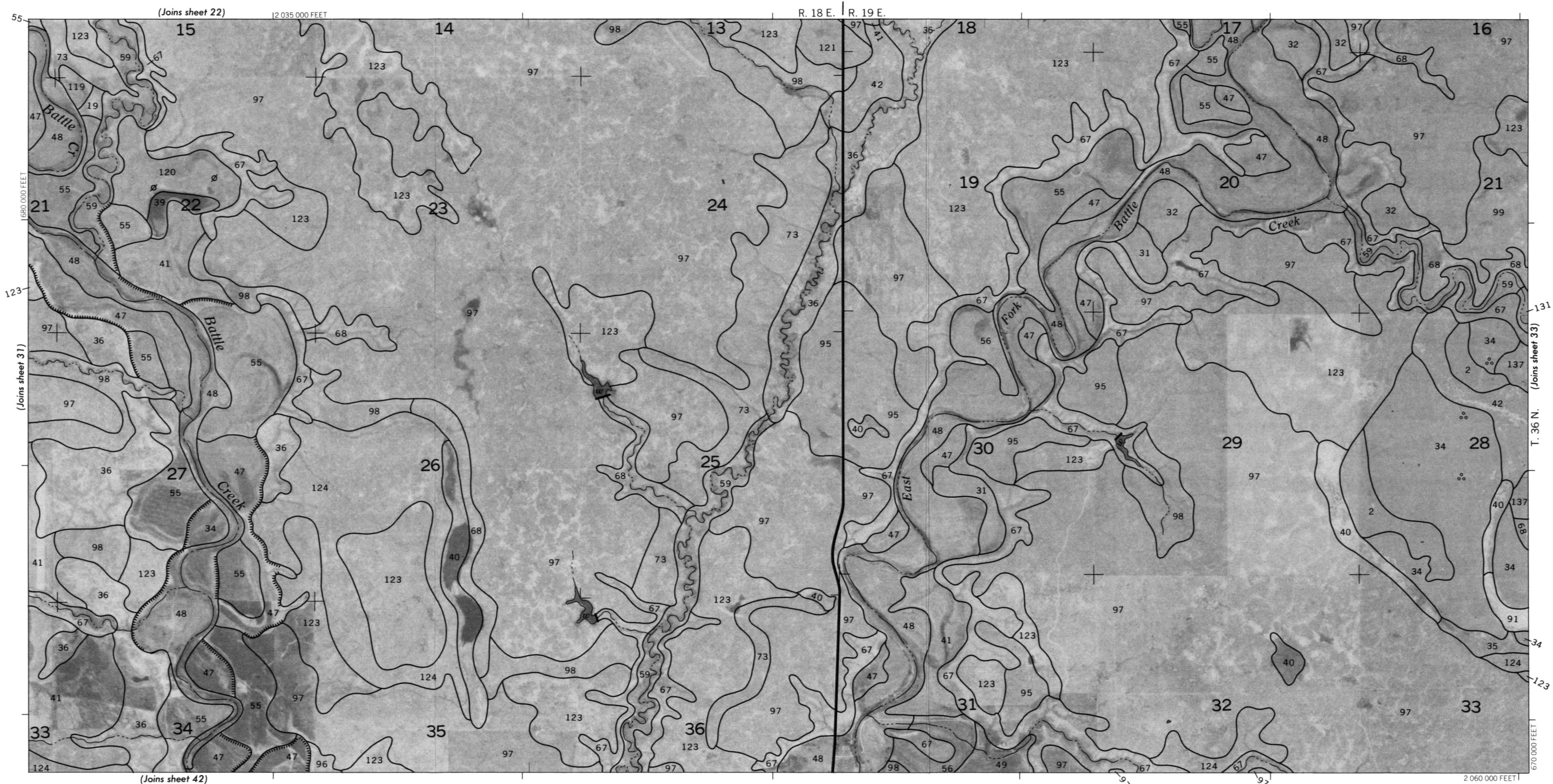


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 31

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

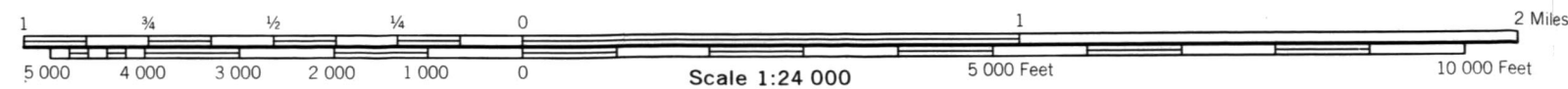
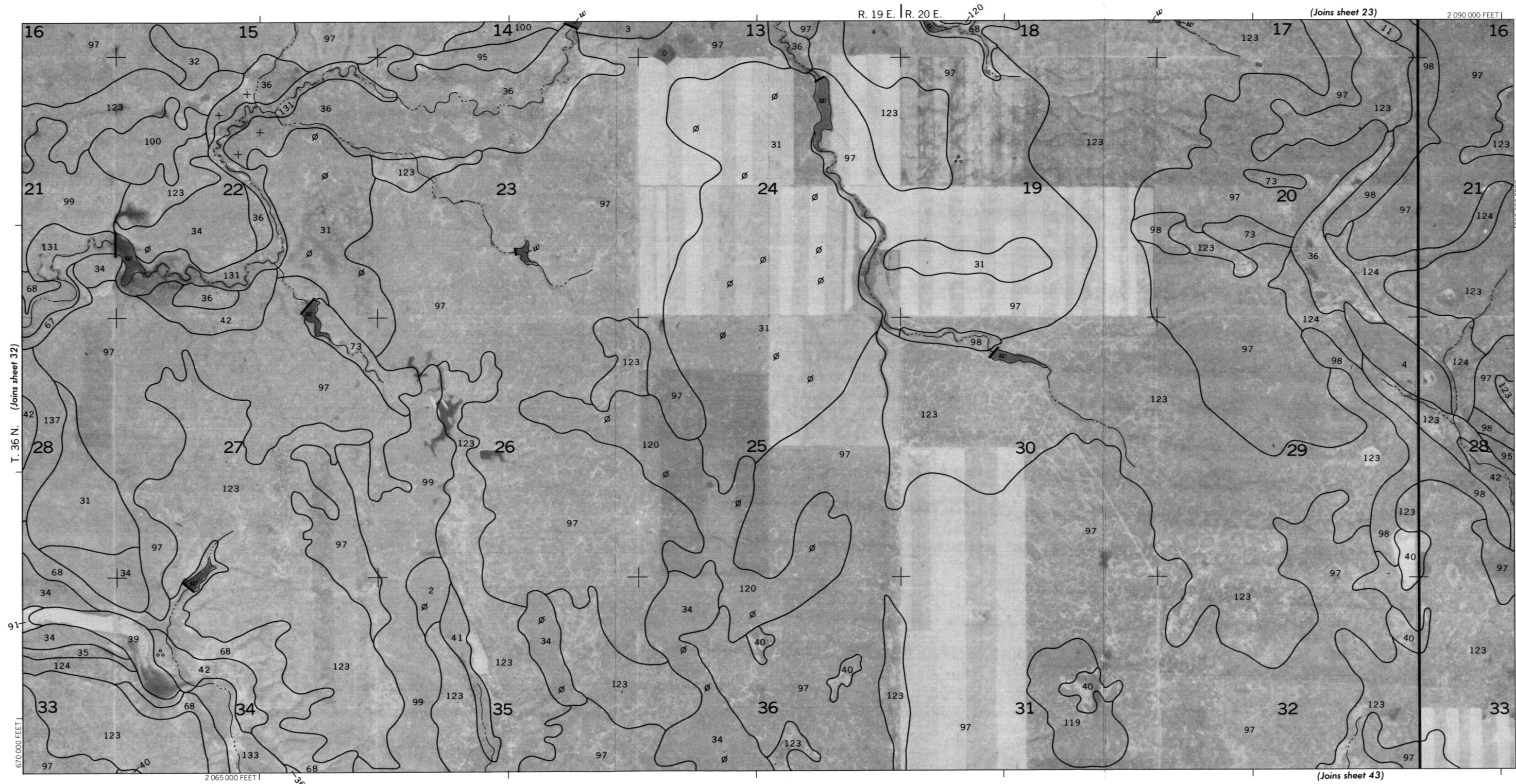


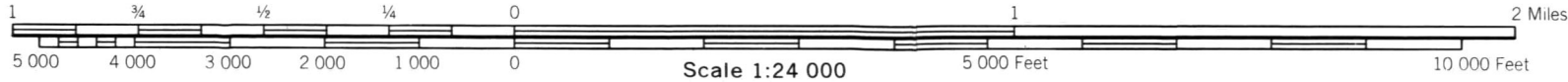
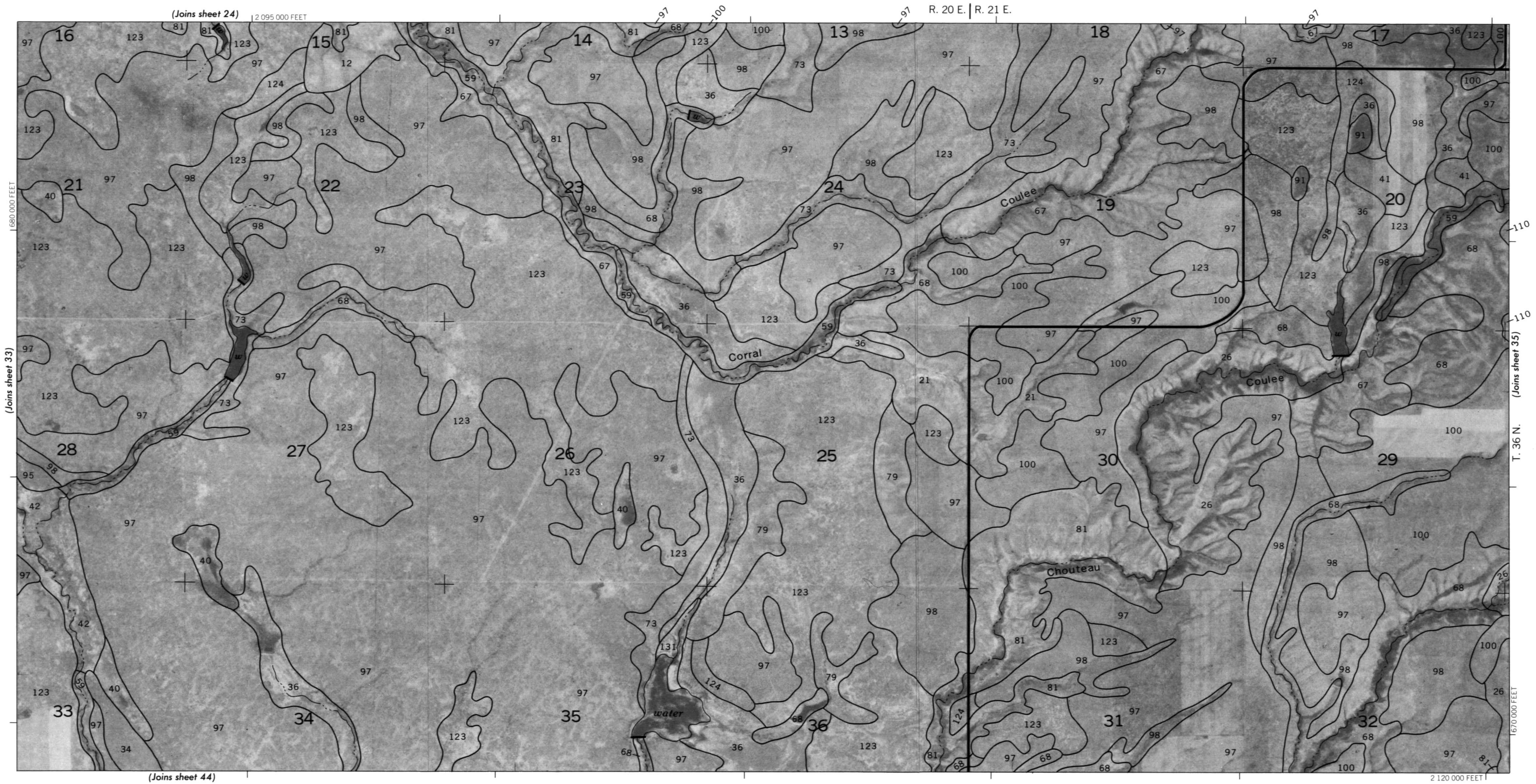


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 33

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



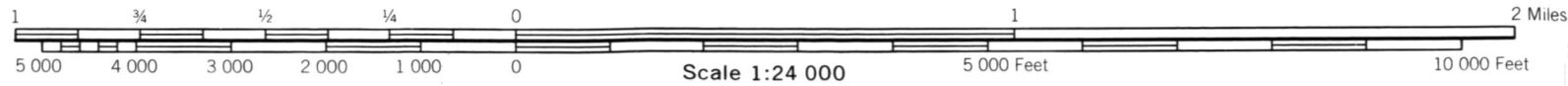
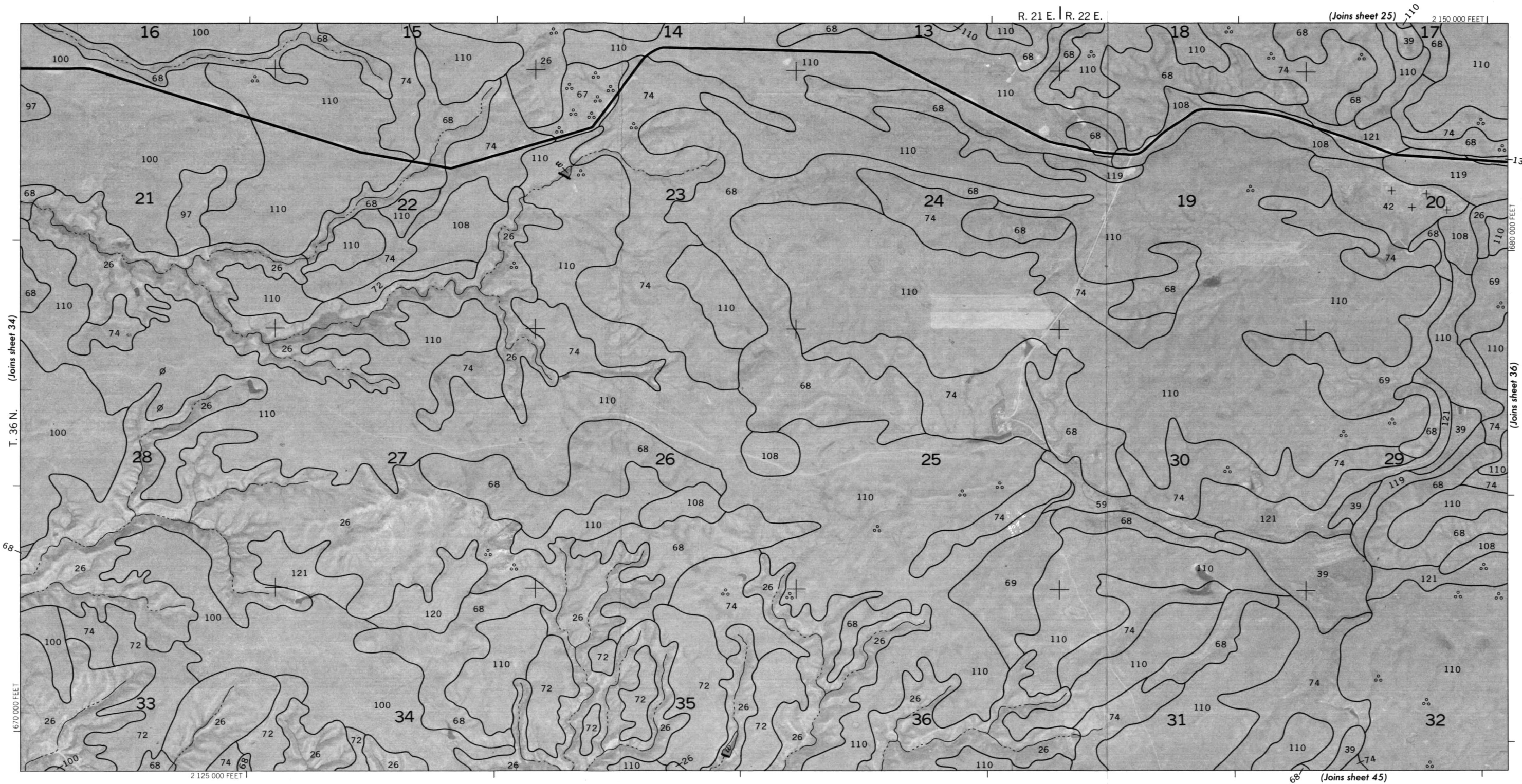


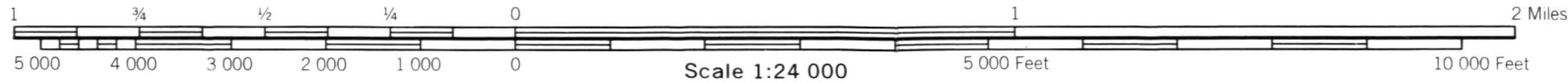
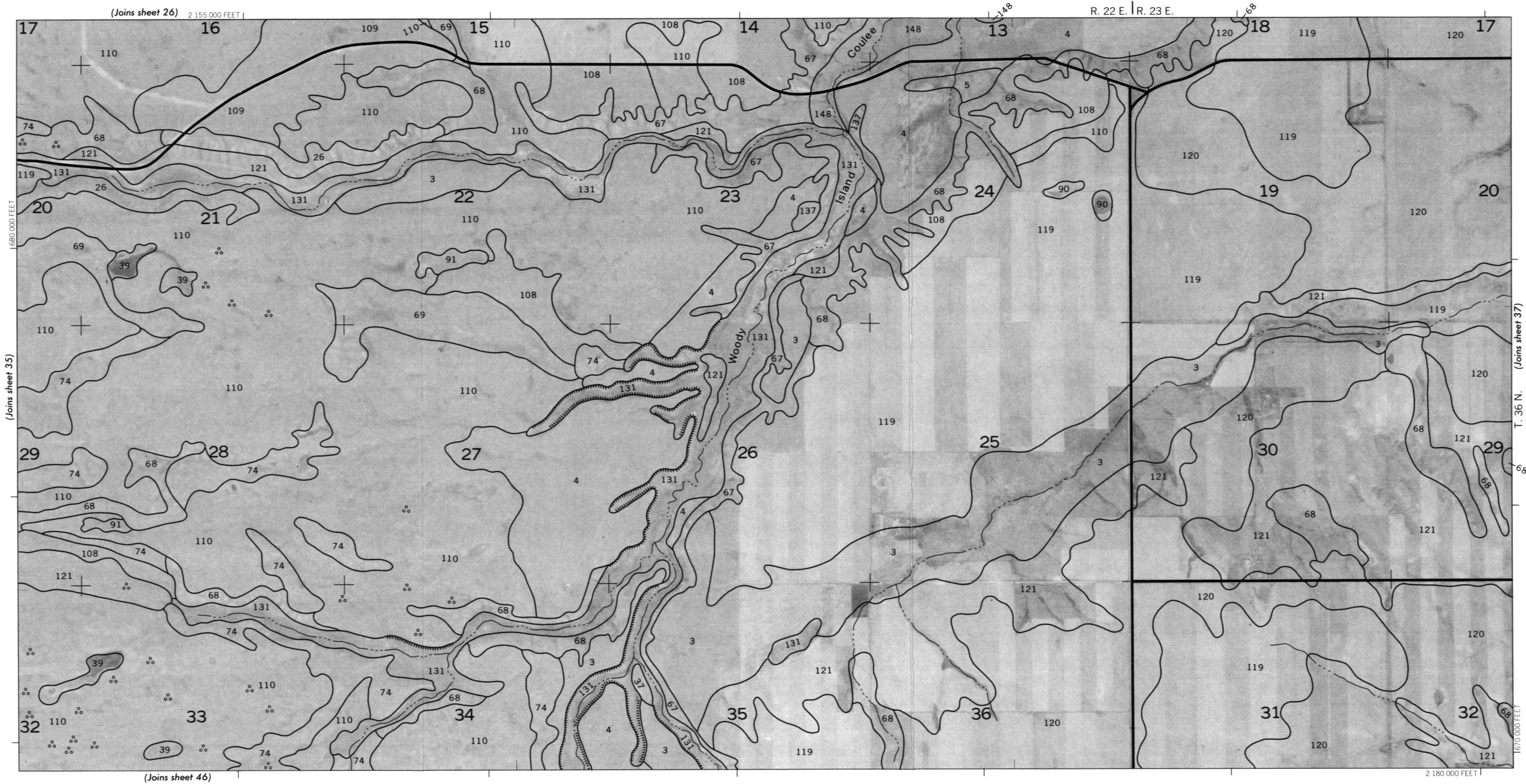
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 35

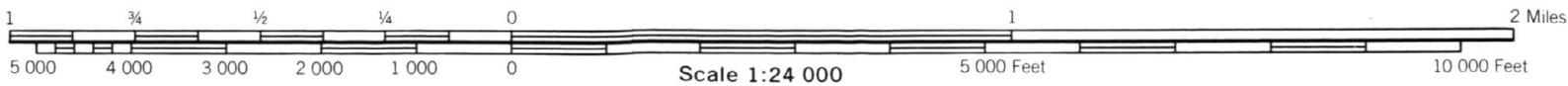
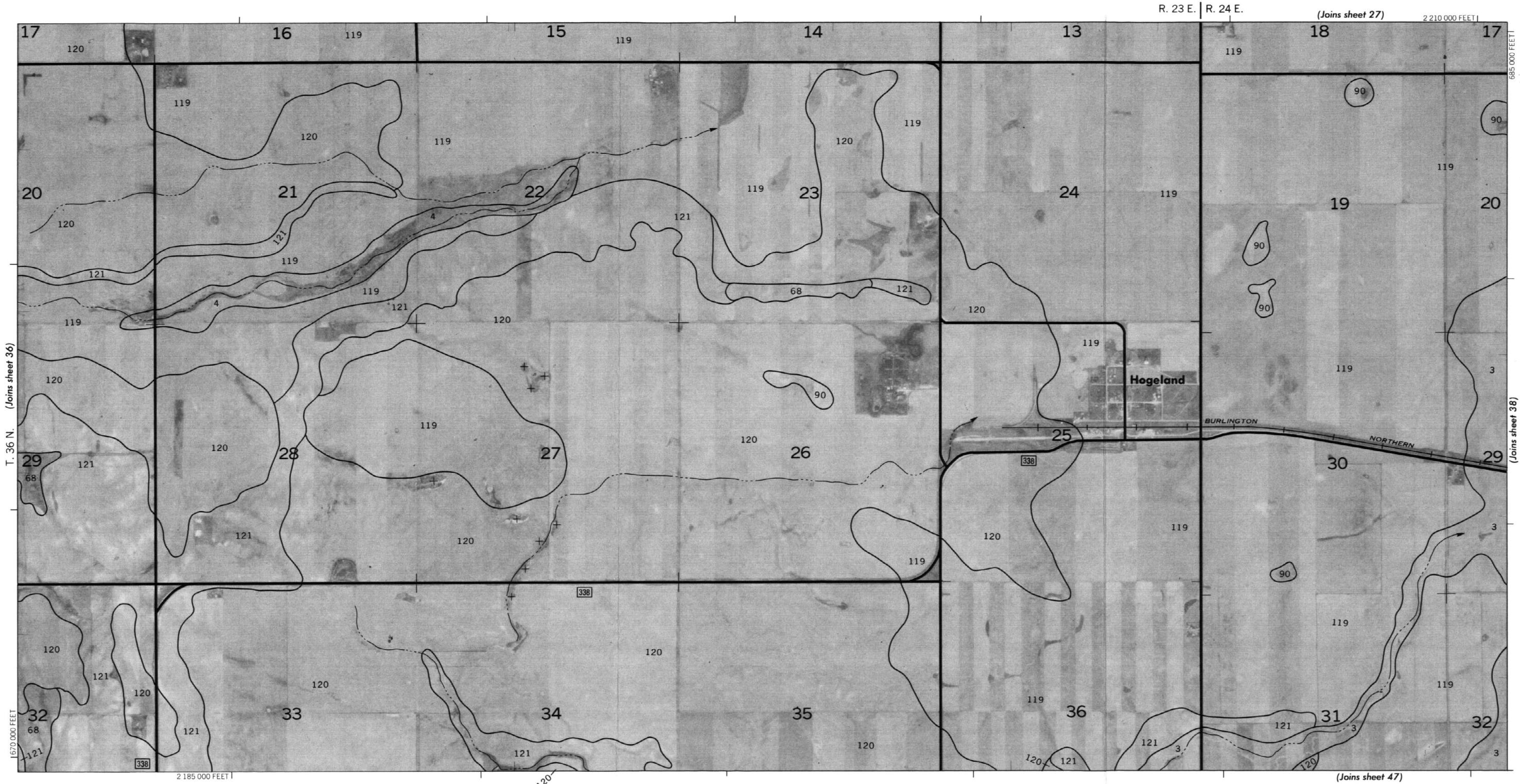
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.

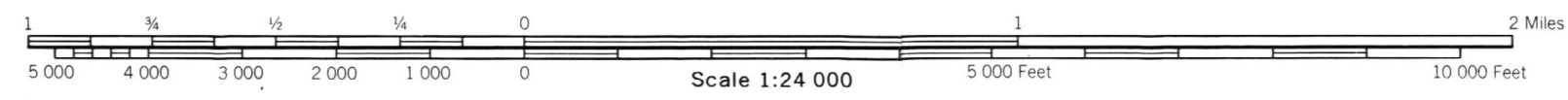
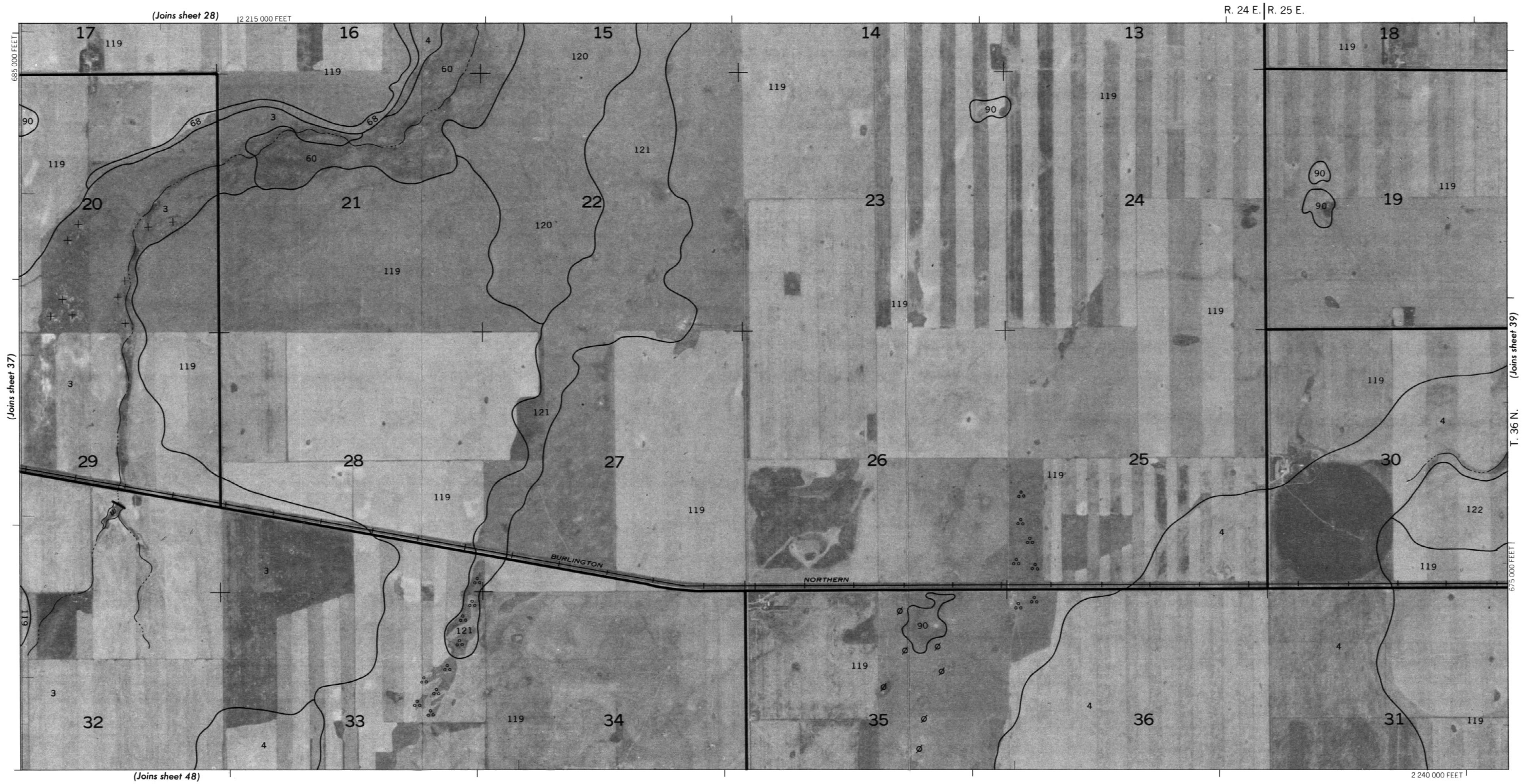
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

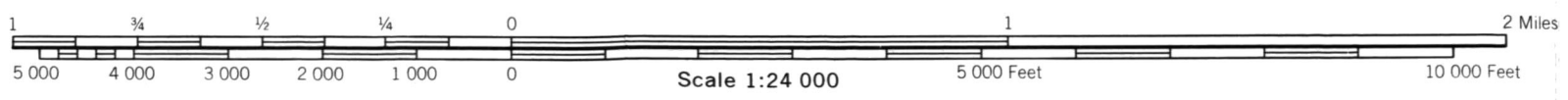
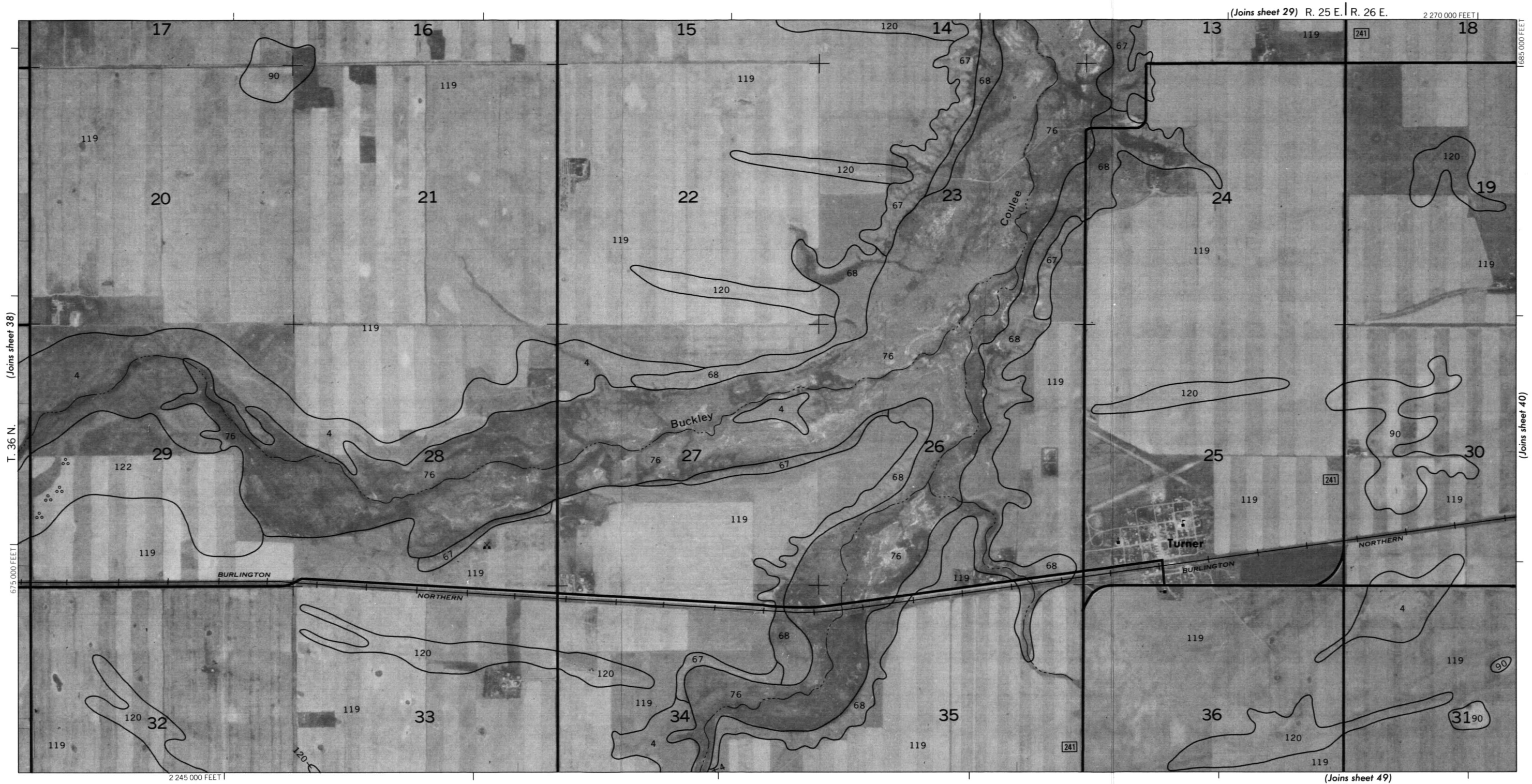


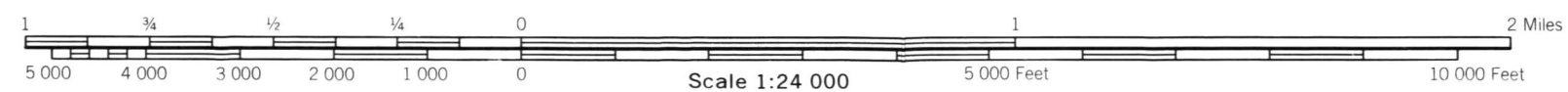


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 39

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





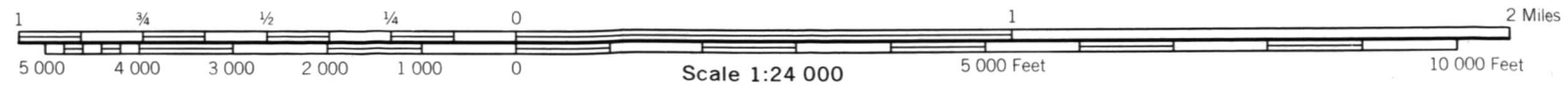
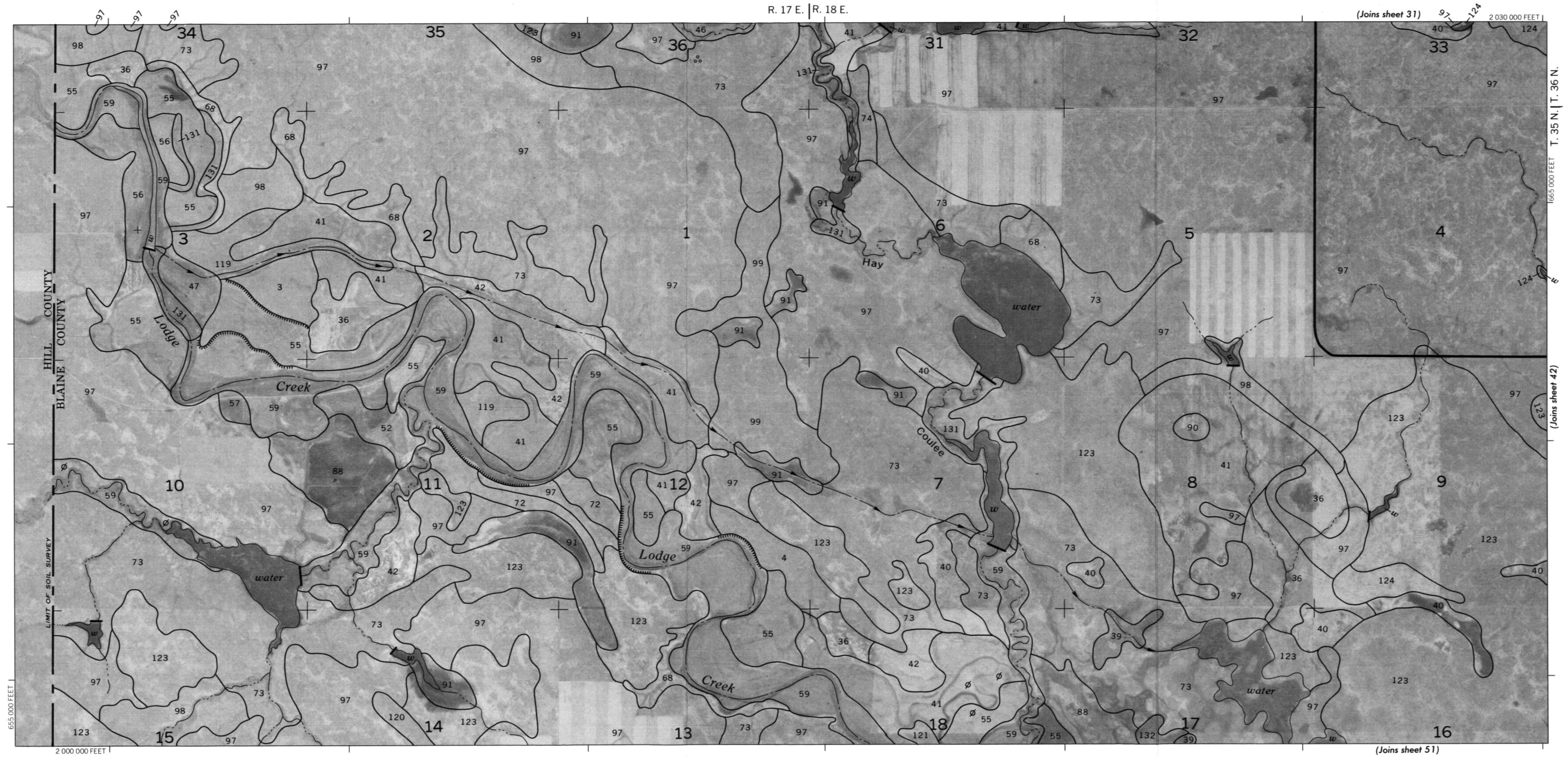
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

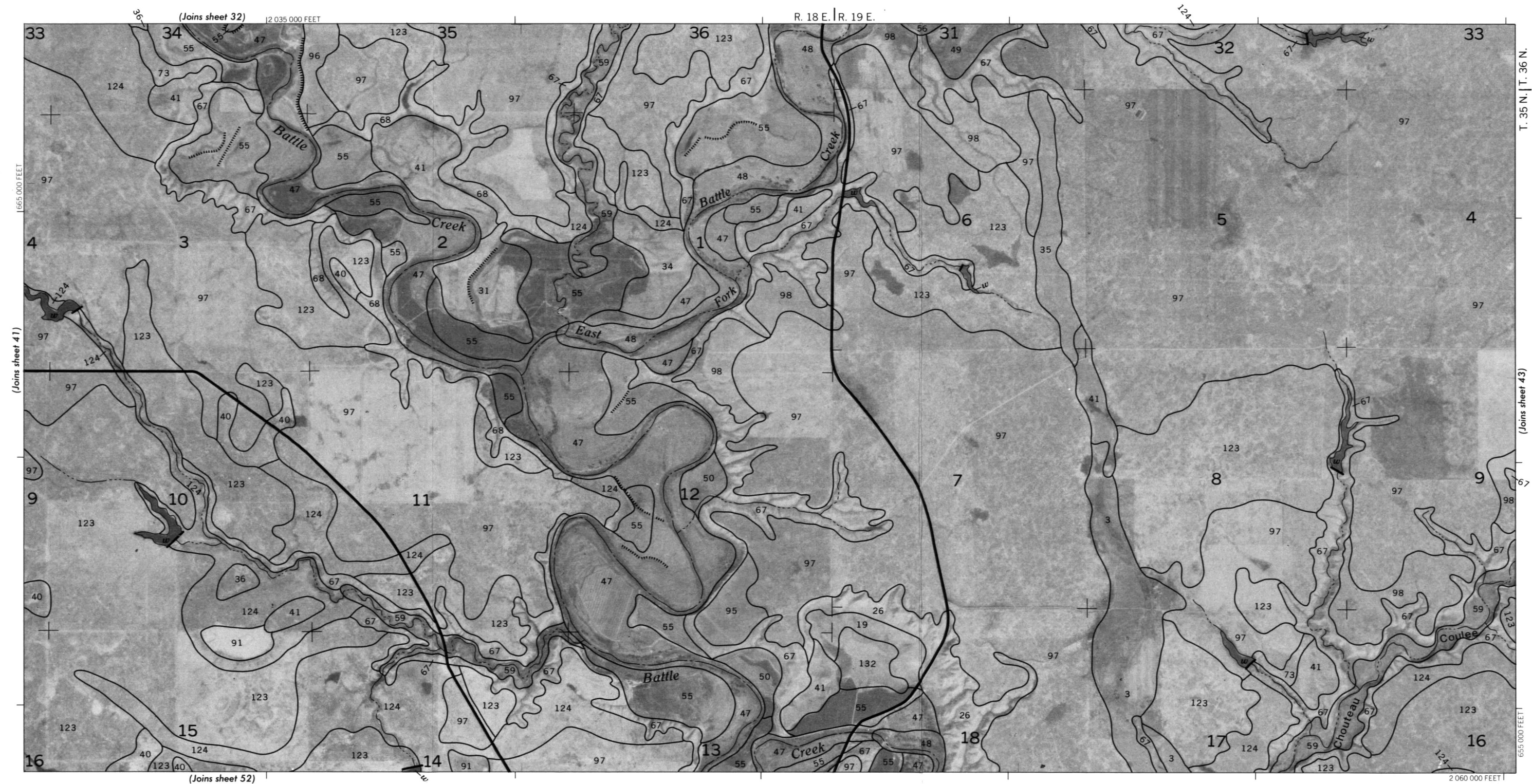
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 41

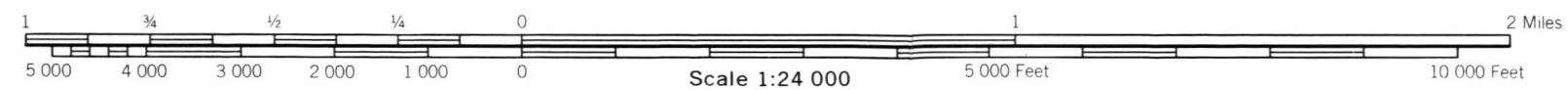
41

N



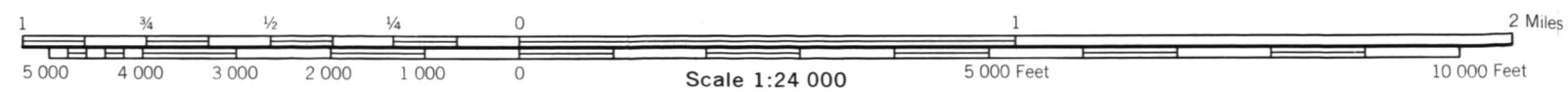
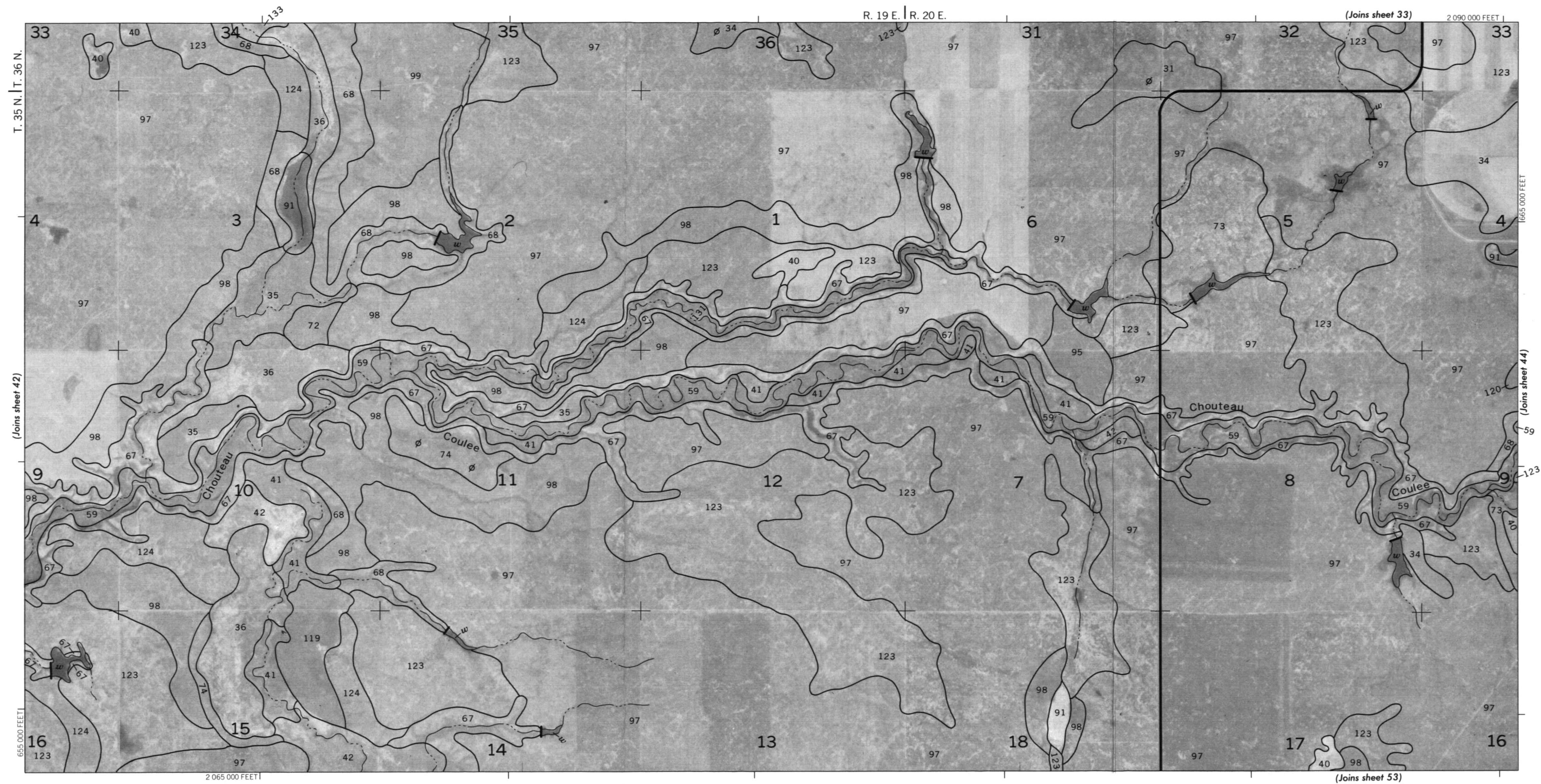


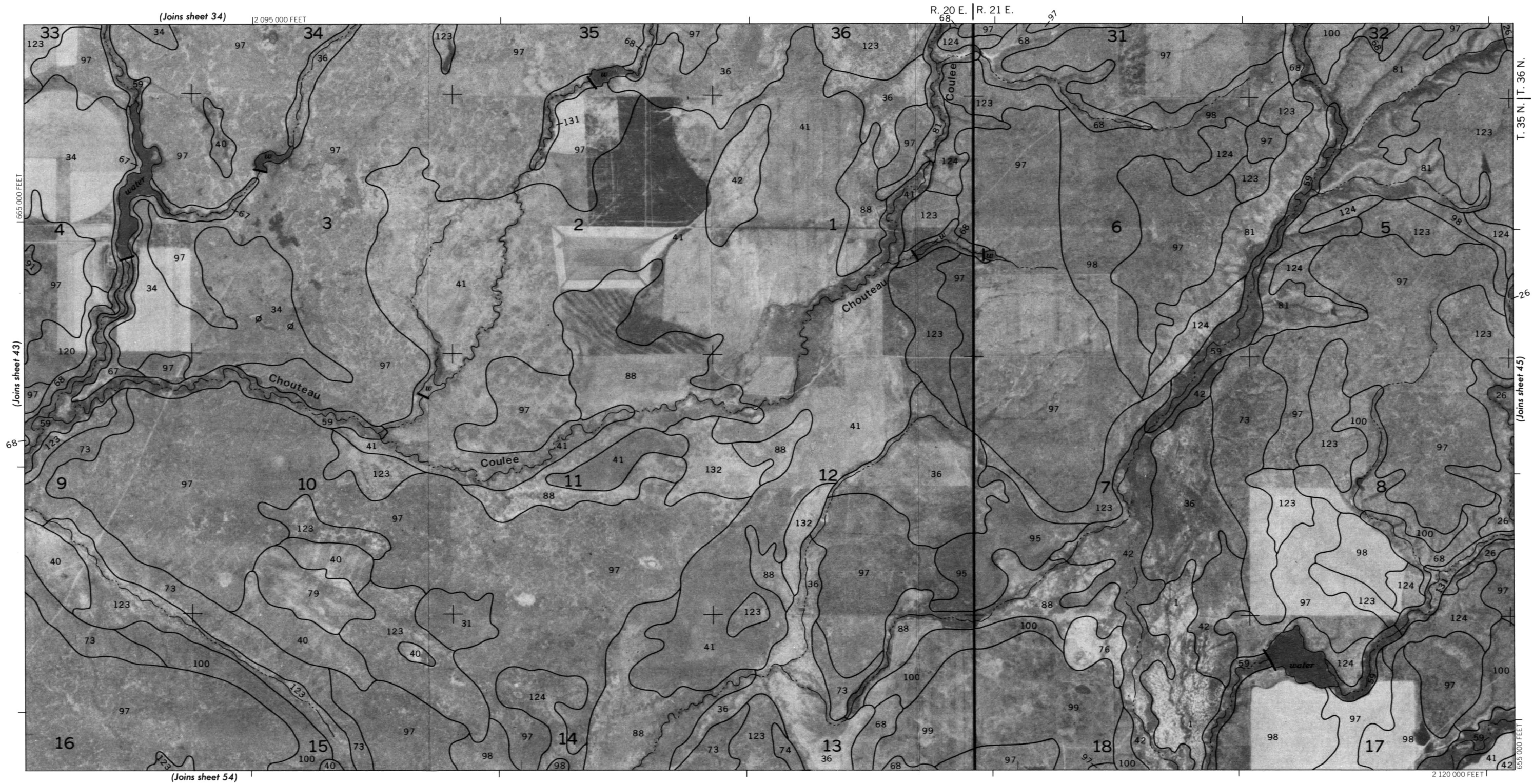
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 43

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

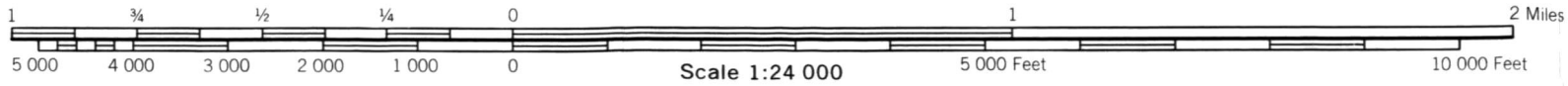
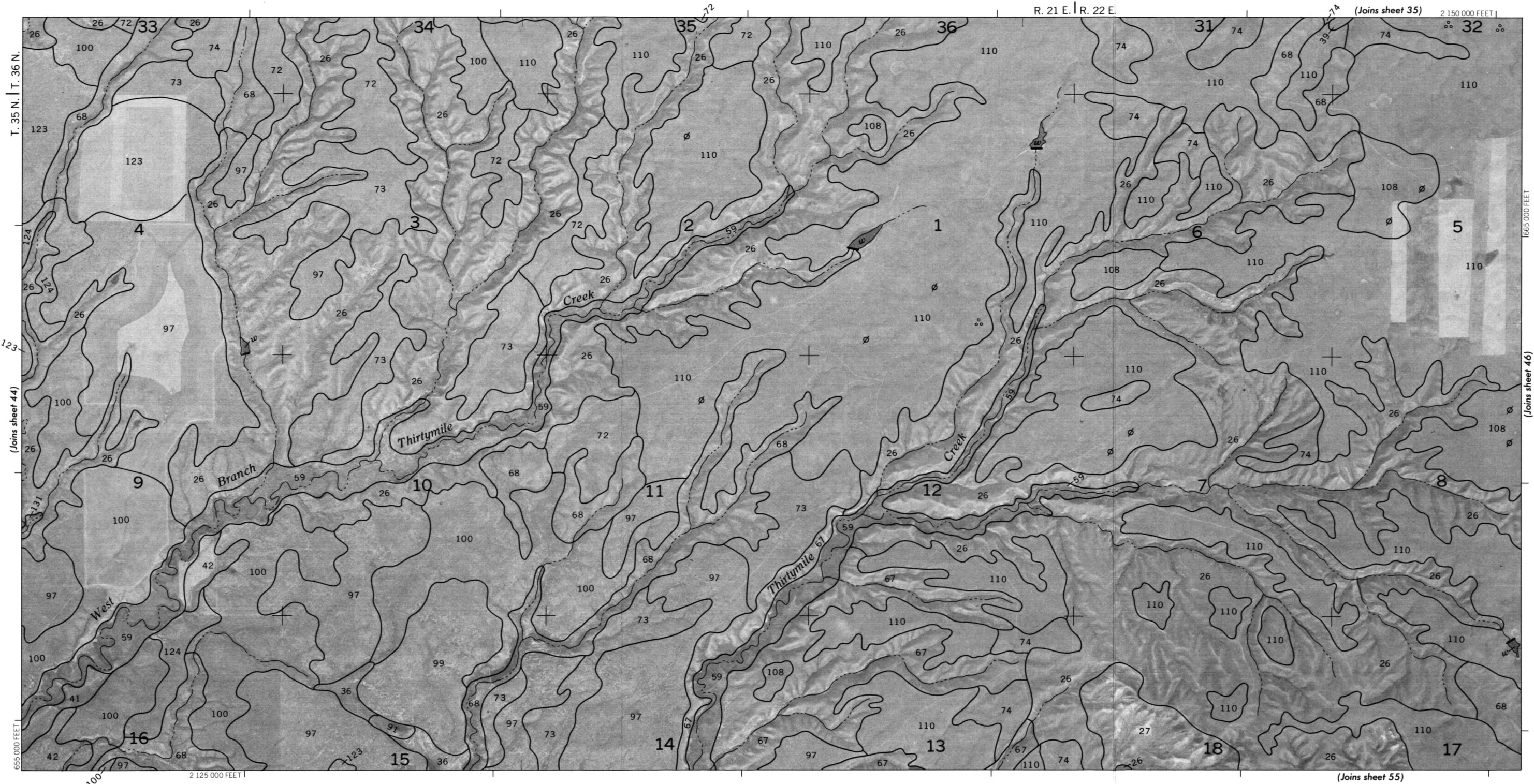




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

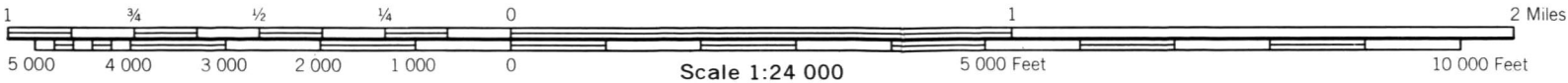
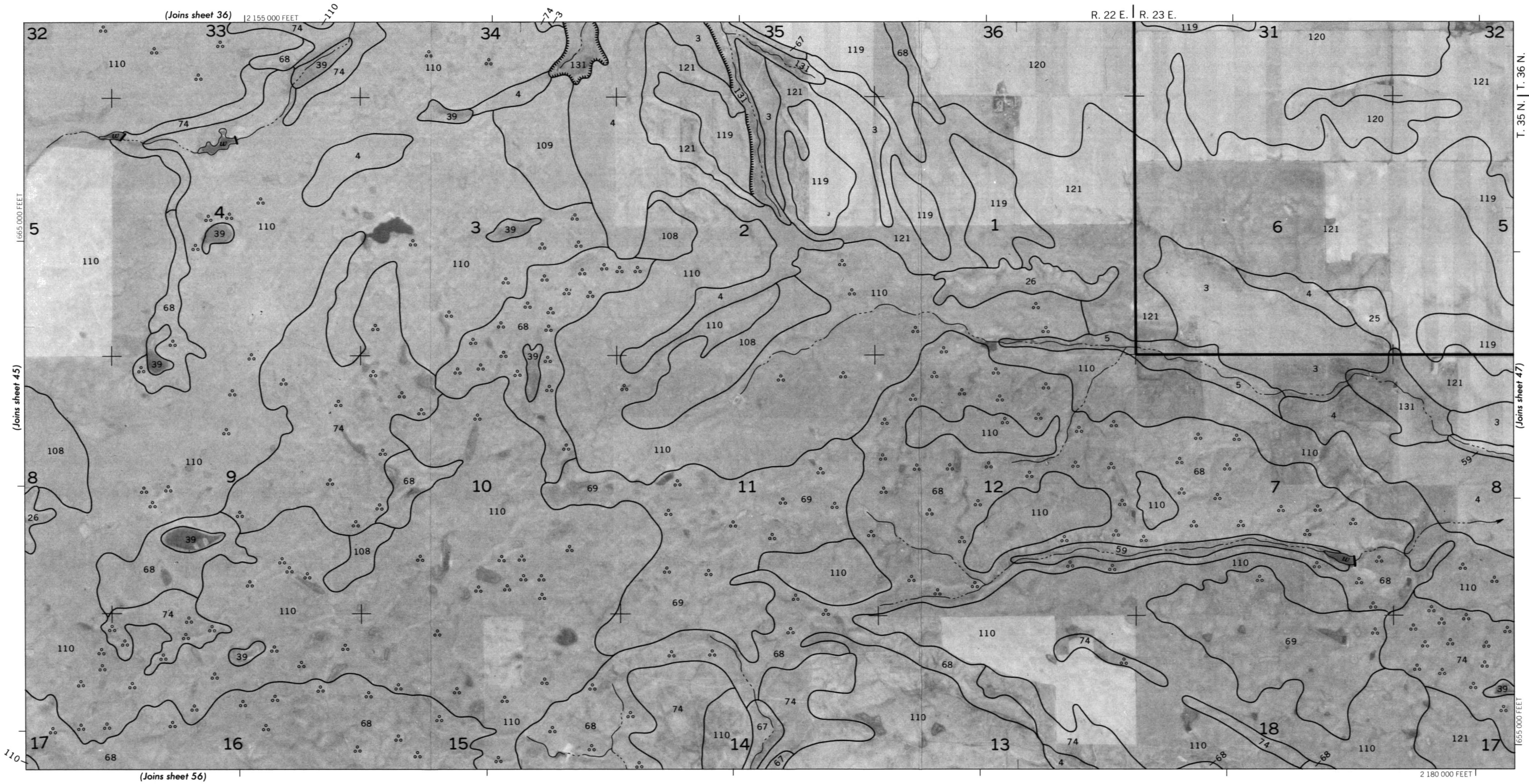
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 45

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



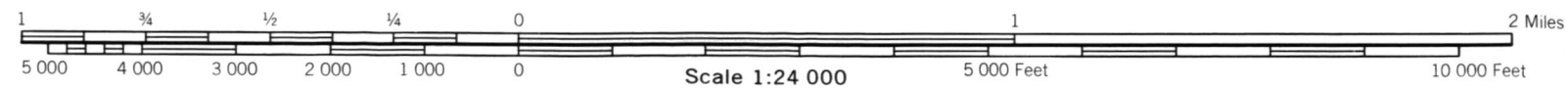


SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 46

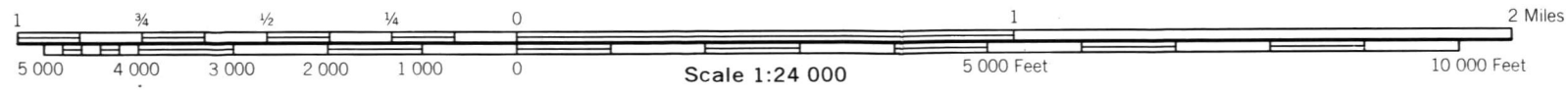
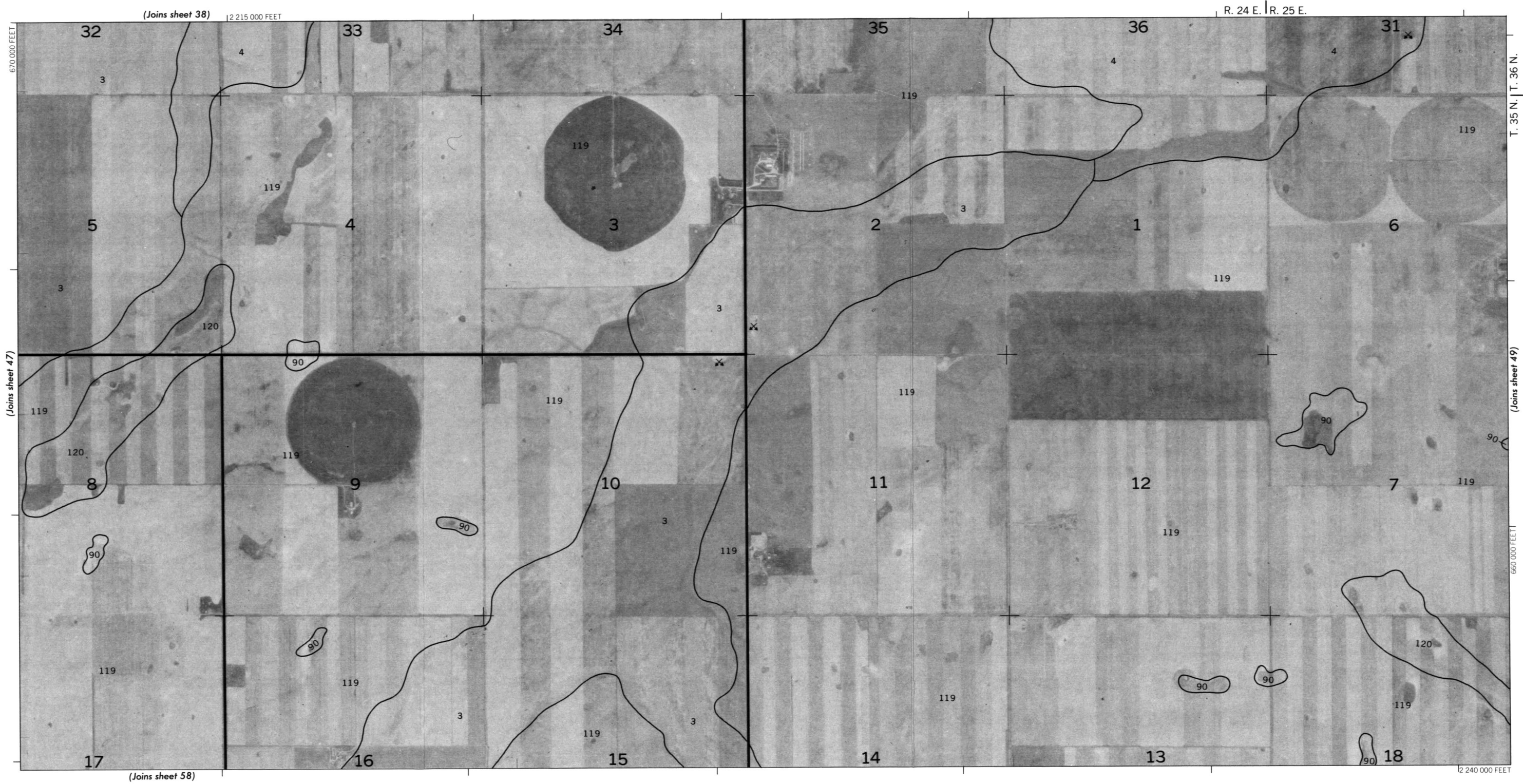


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



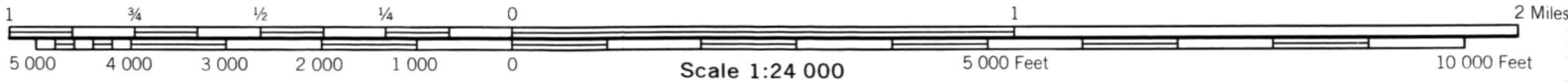
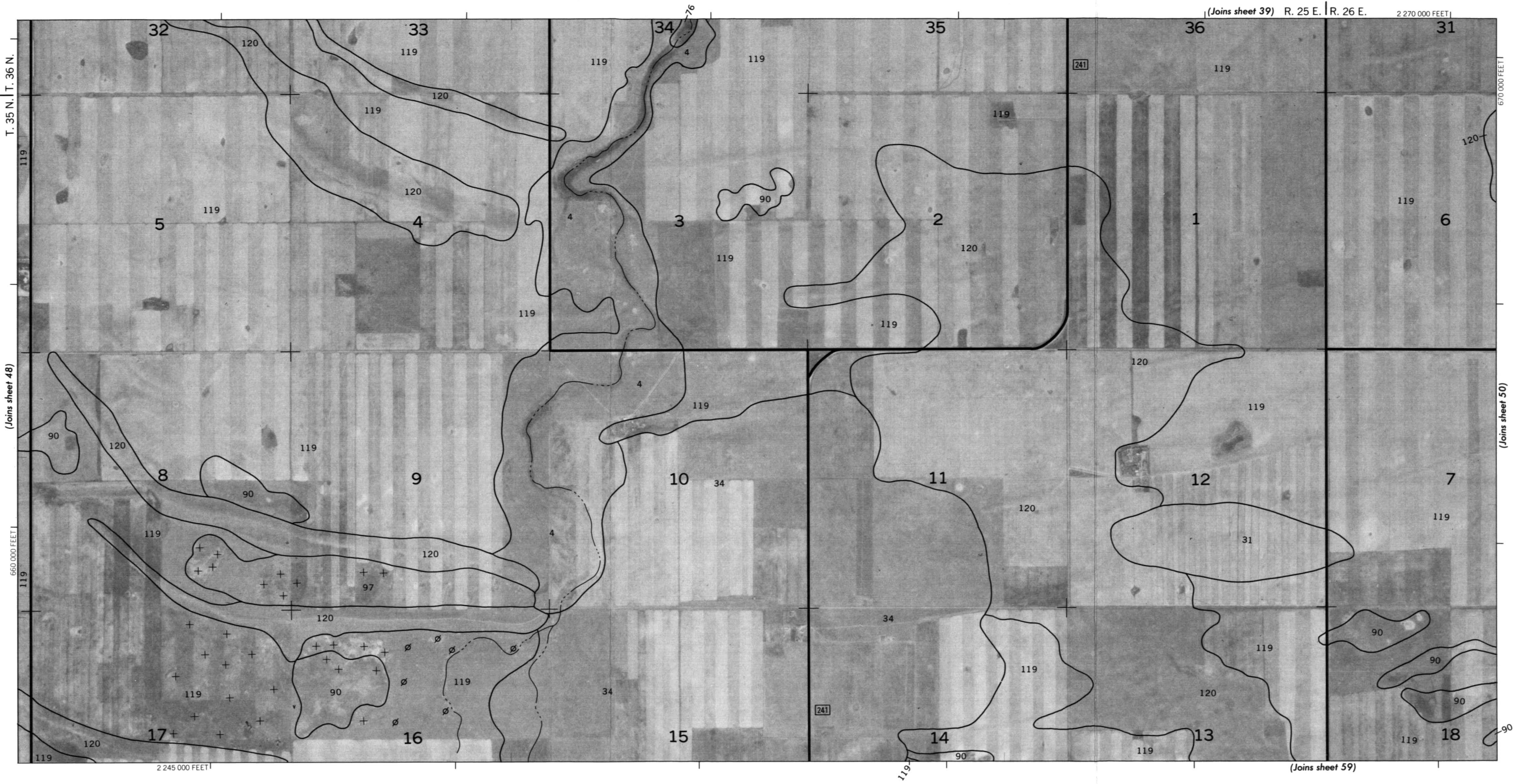
(Joins sheet 57)

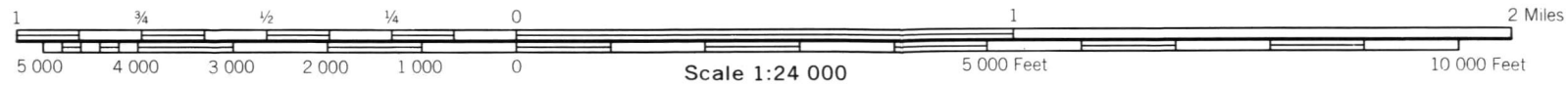
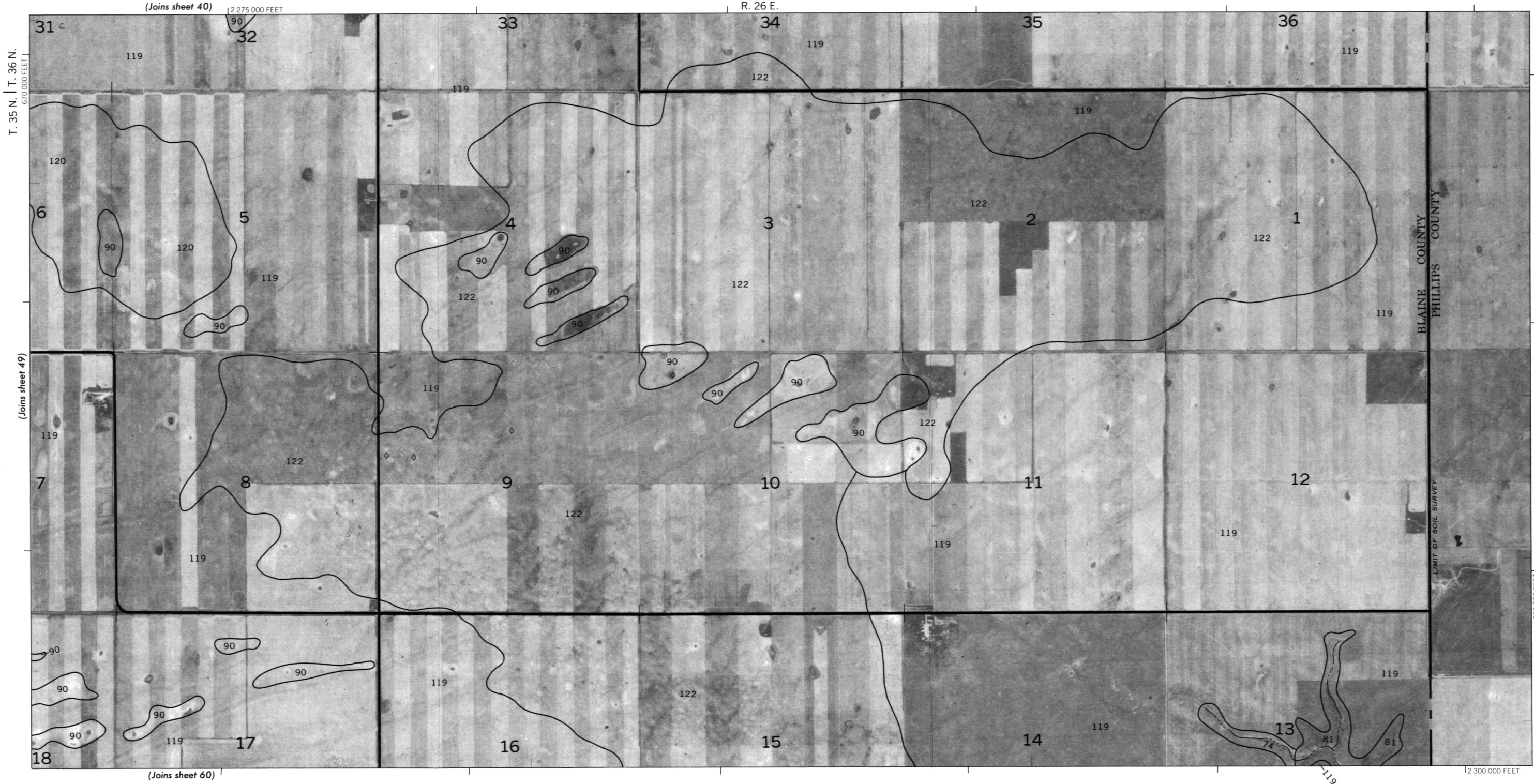


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

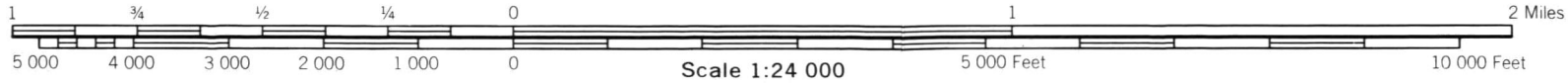
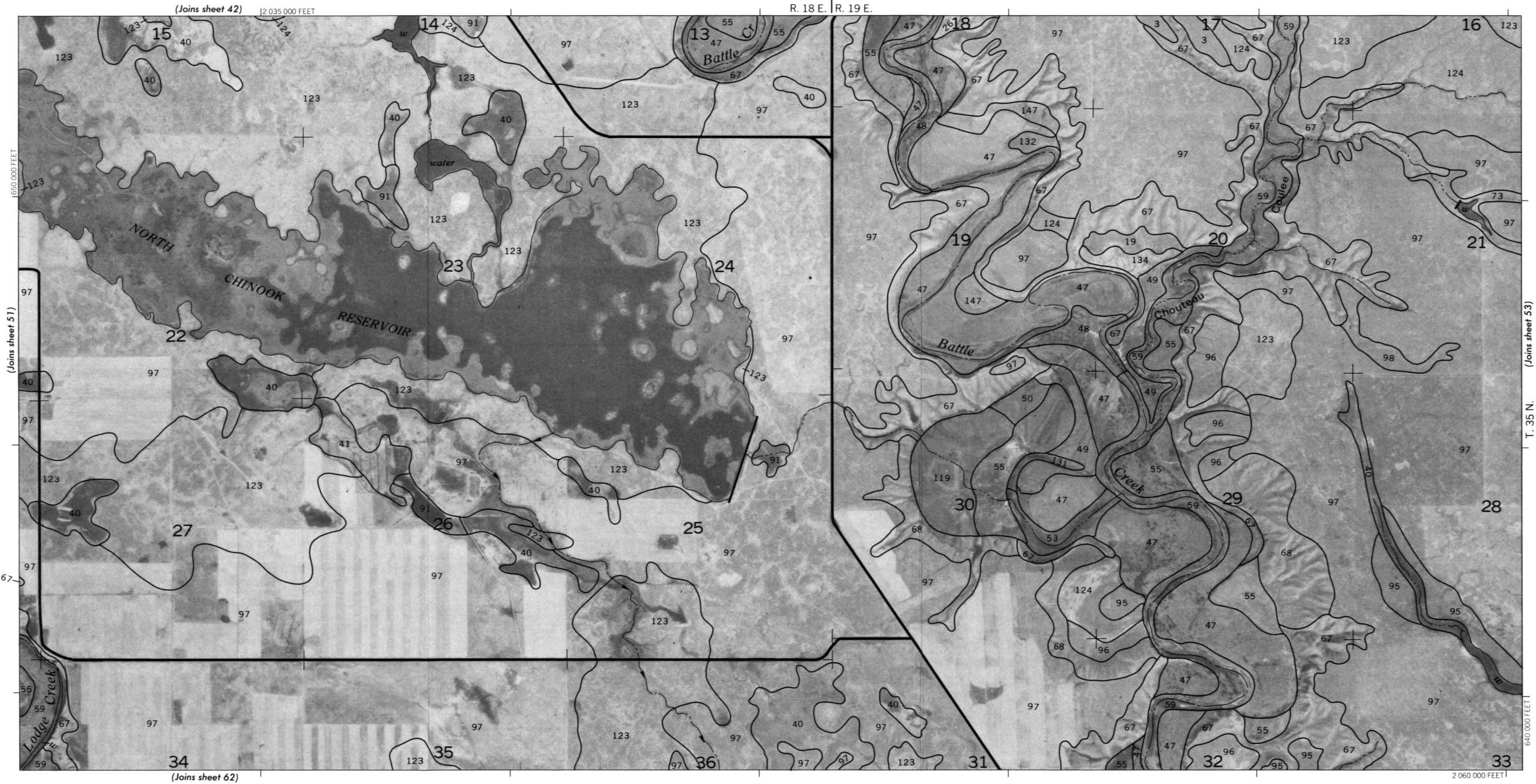
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 49

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

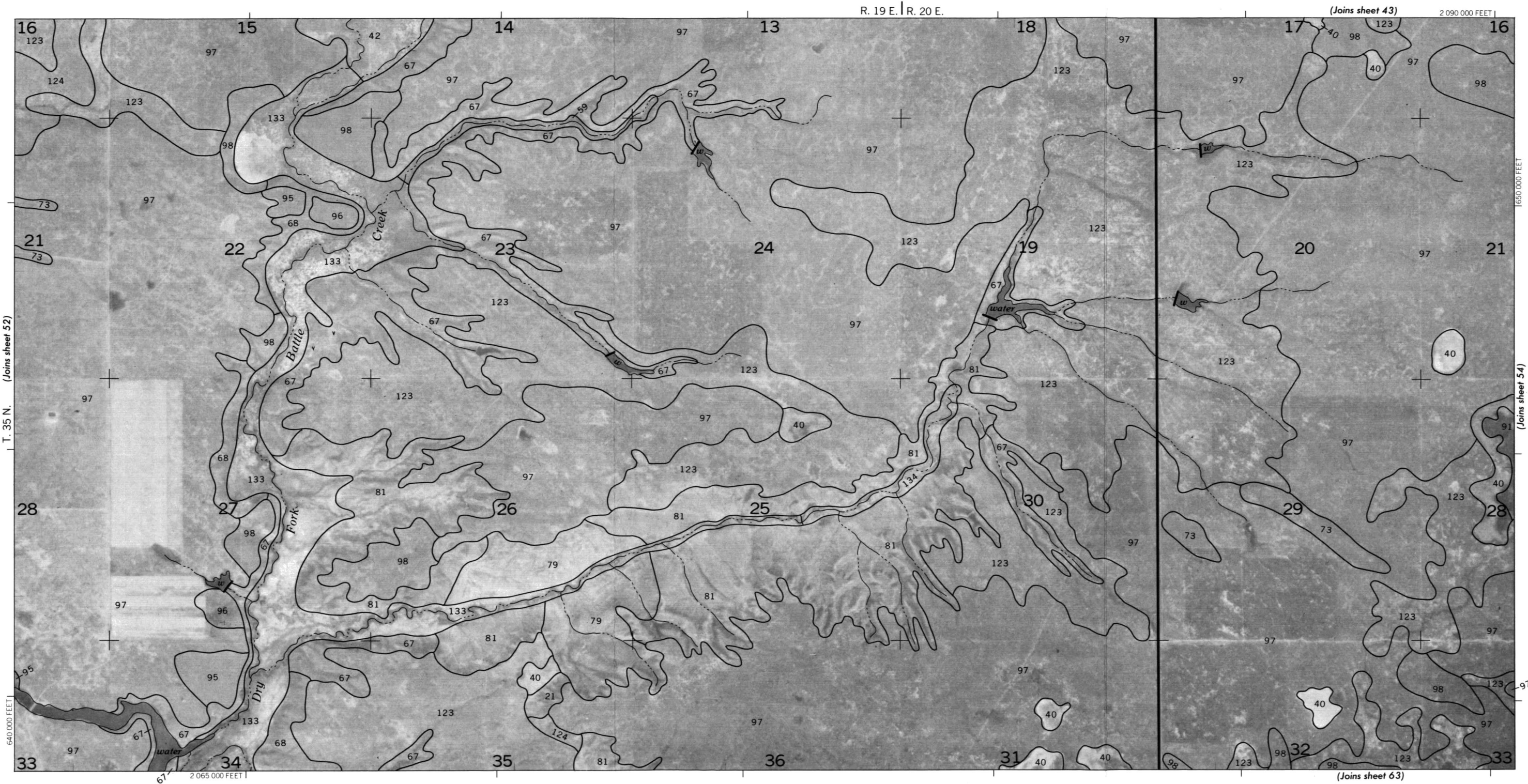




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

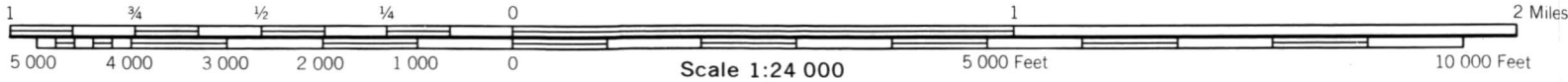


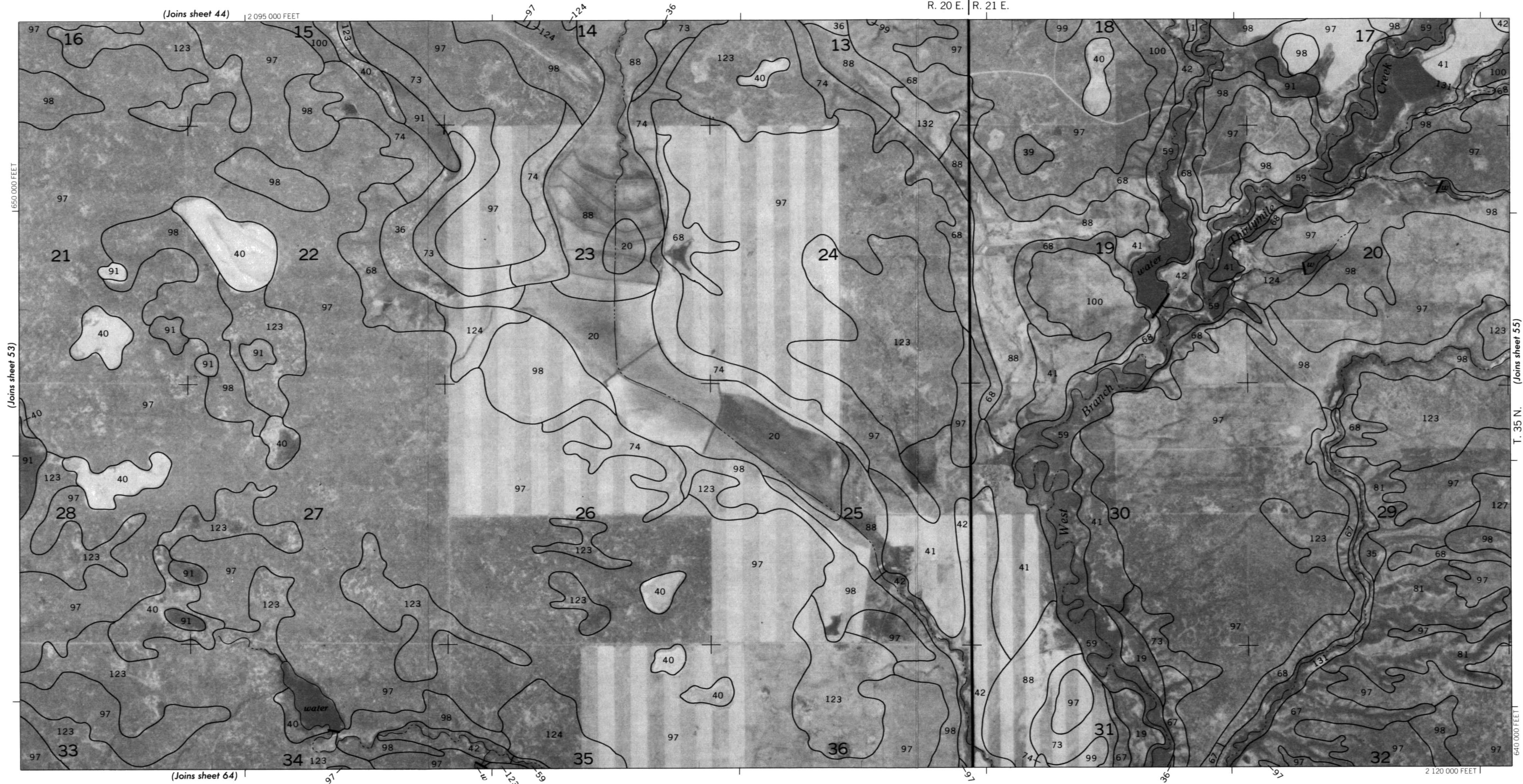
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 53

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

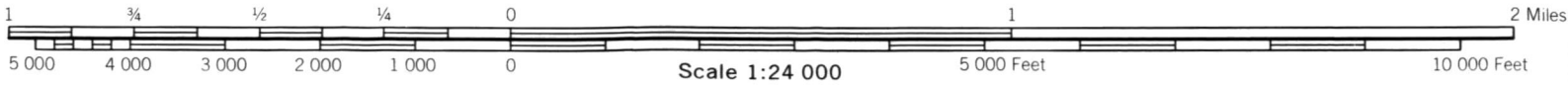
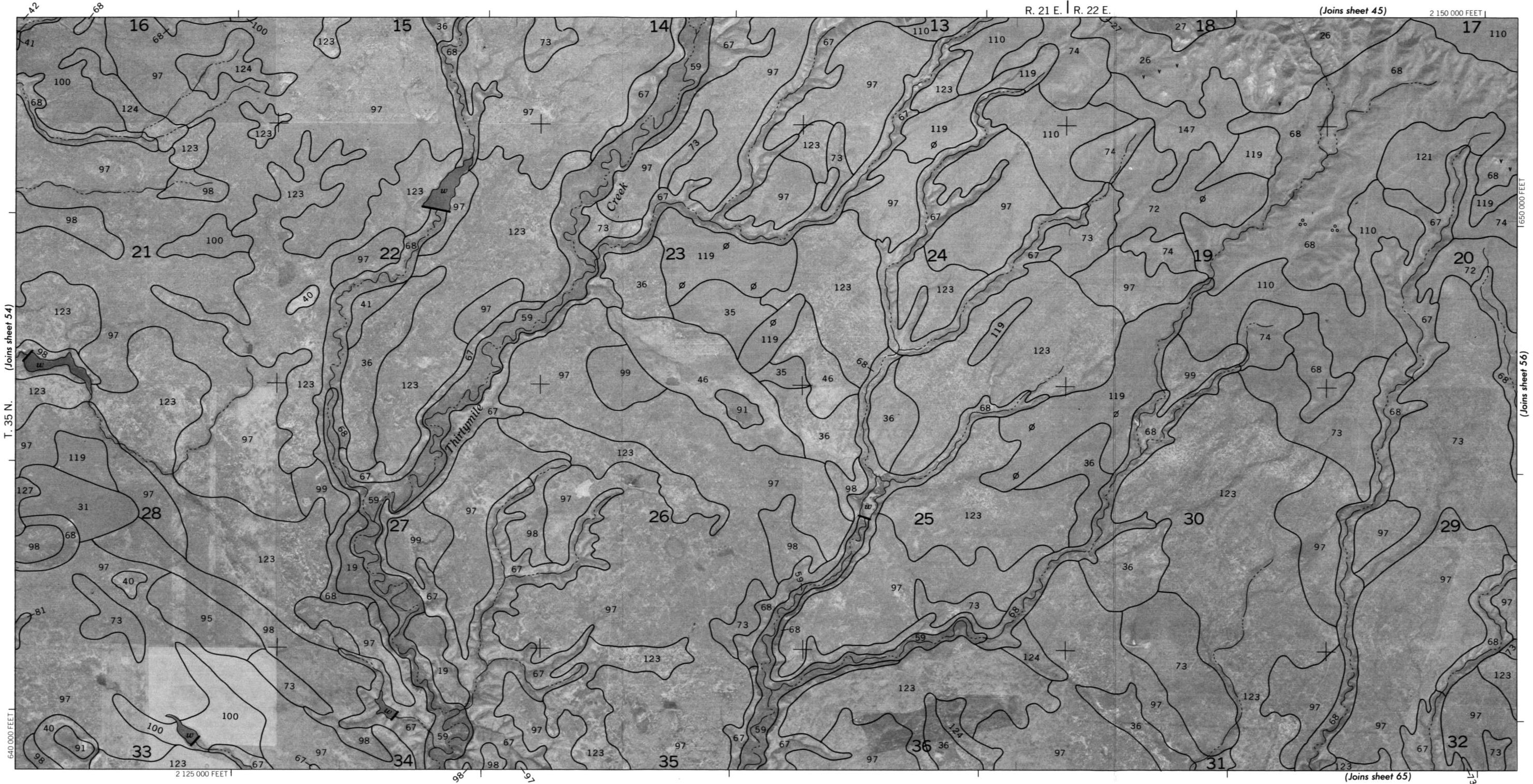


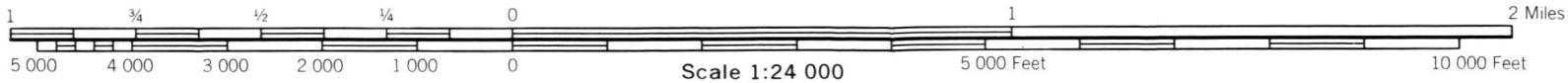
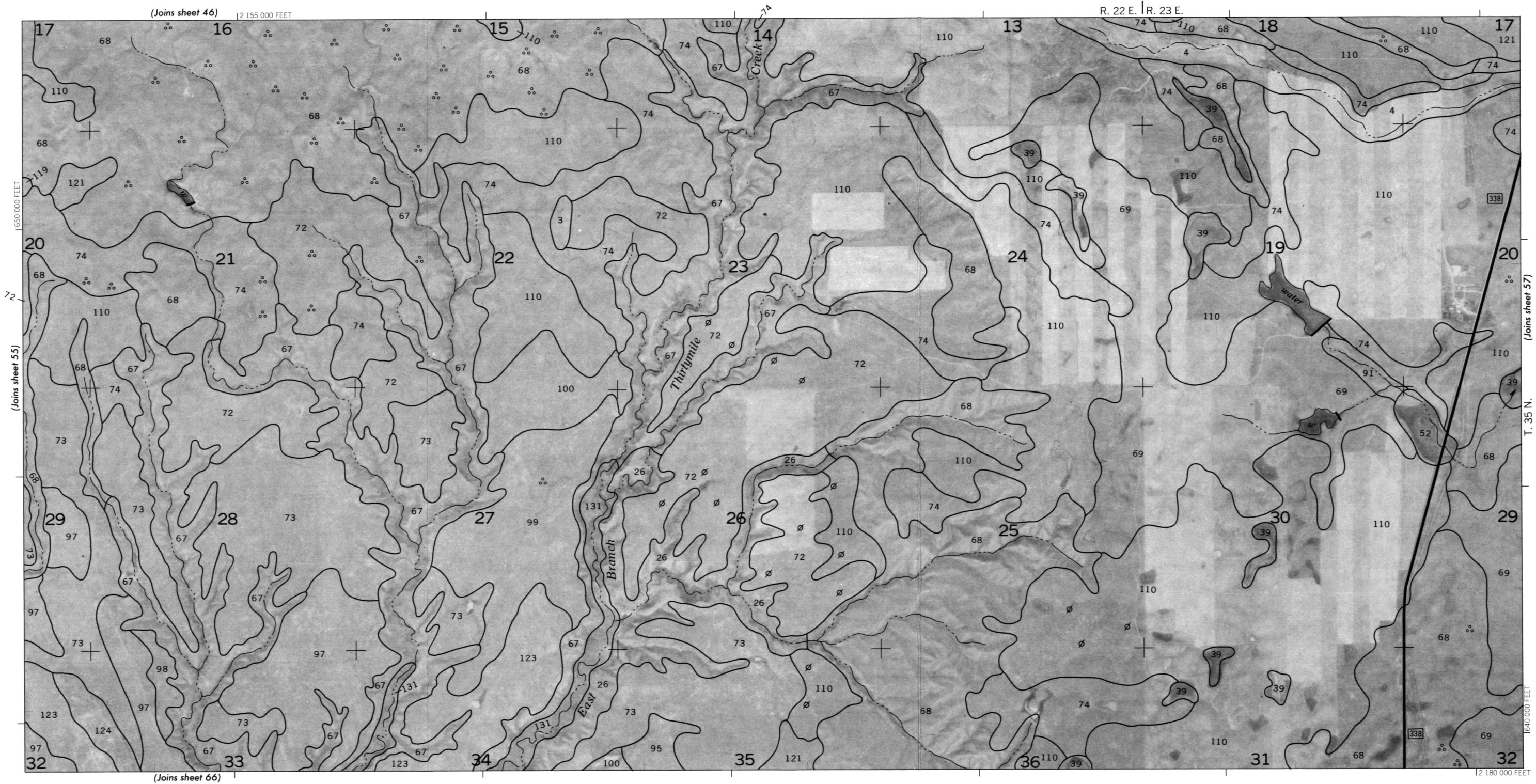


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 55

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

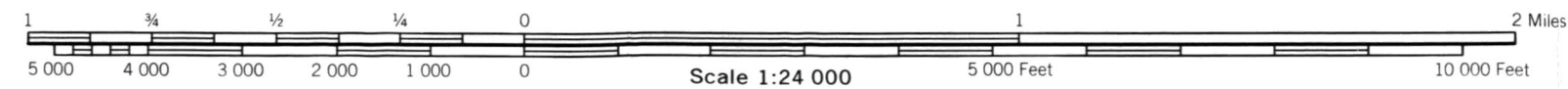


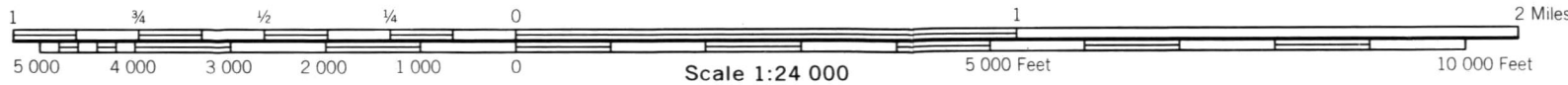


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 57

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

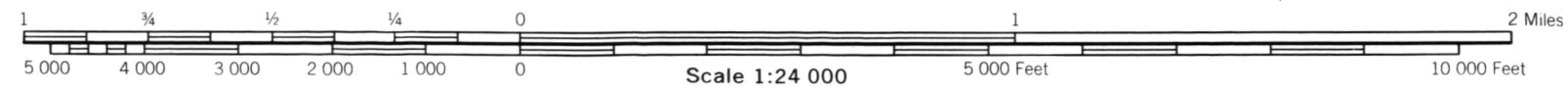
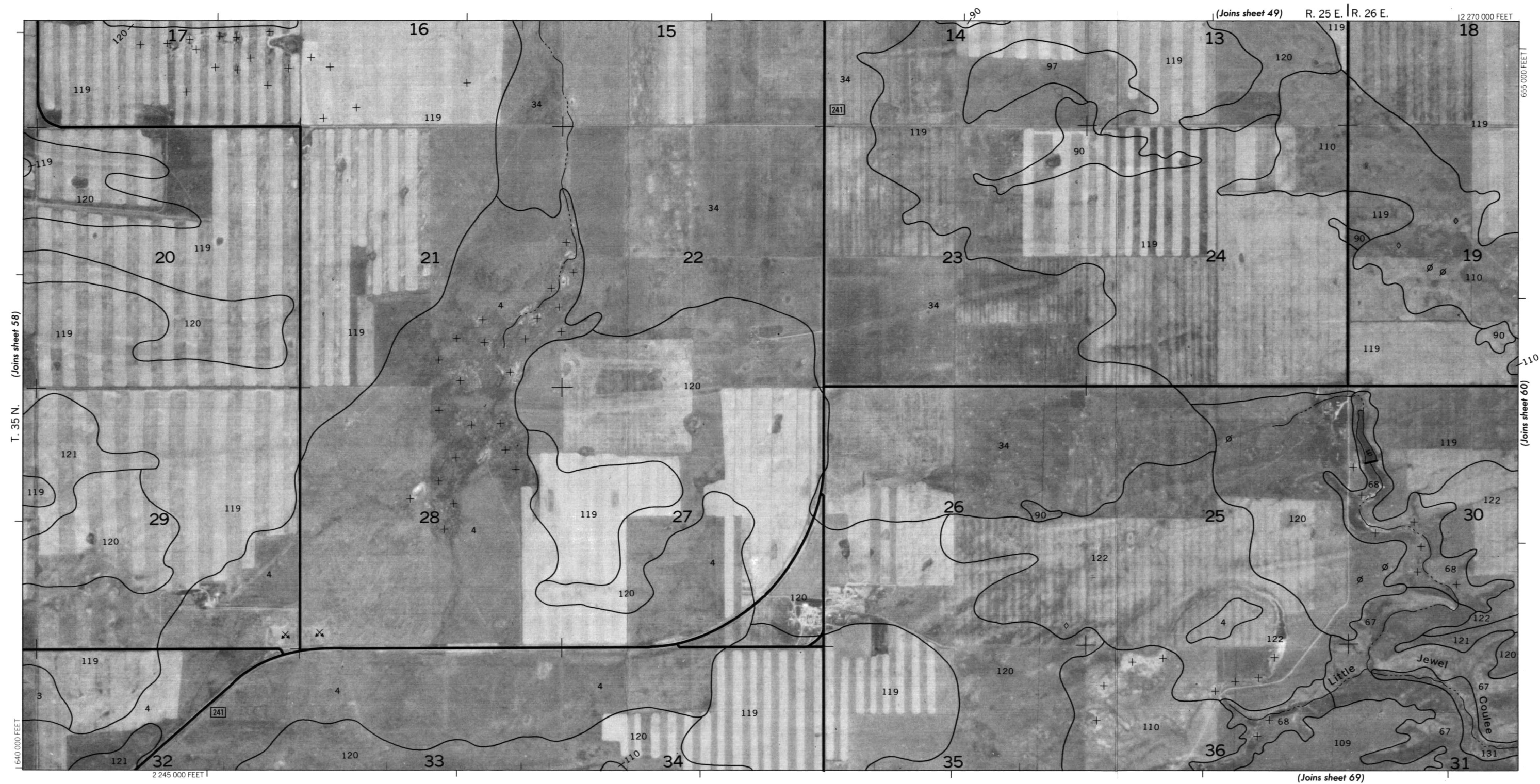


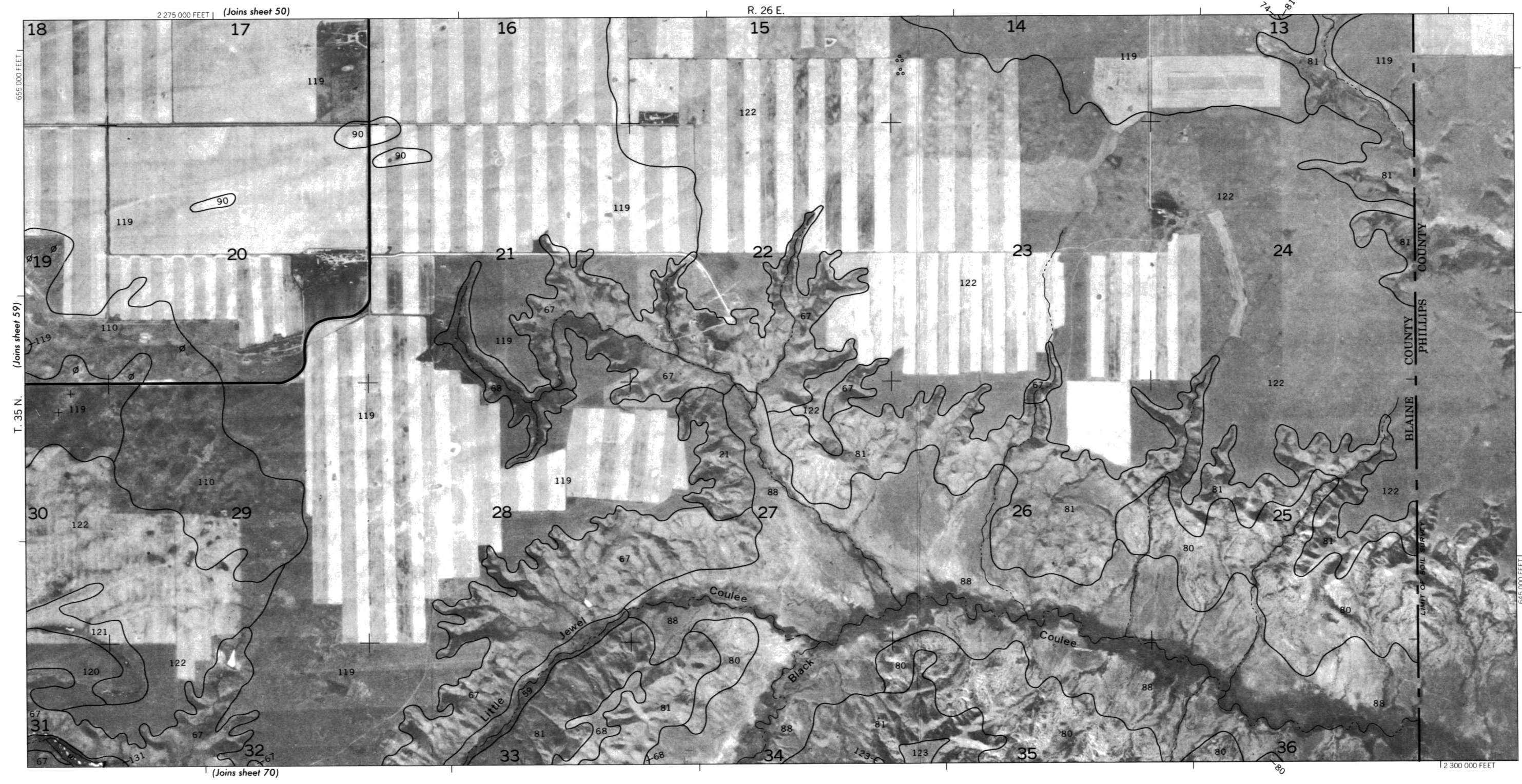


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 59

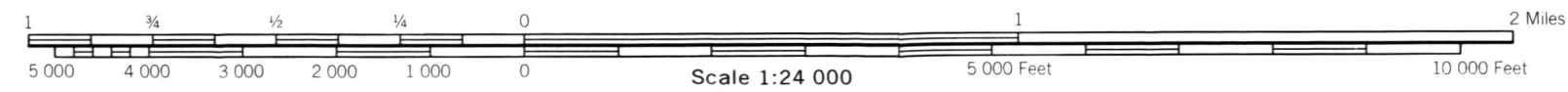
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

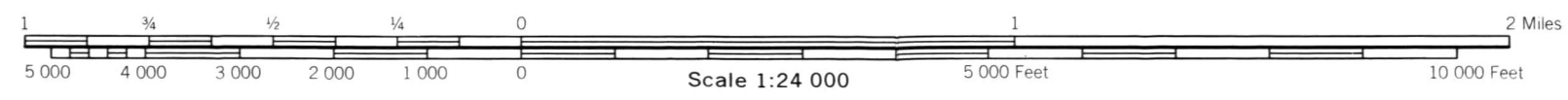
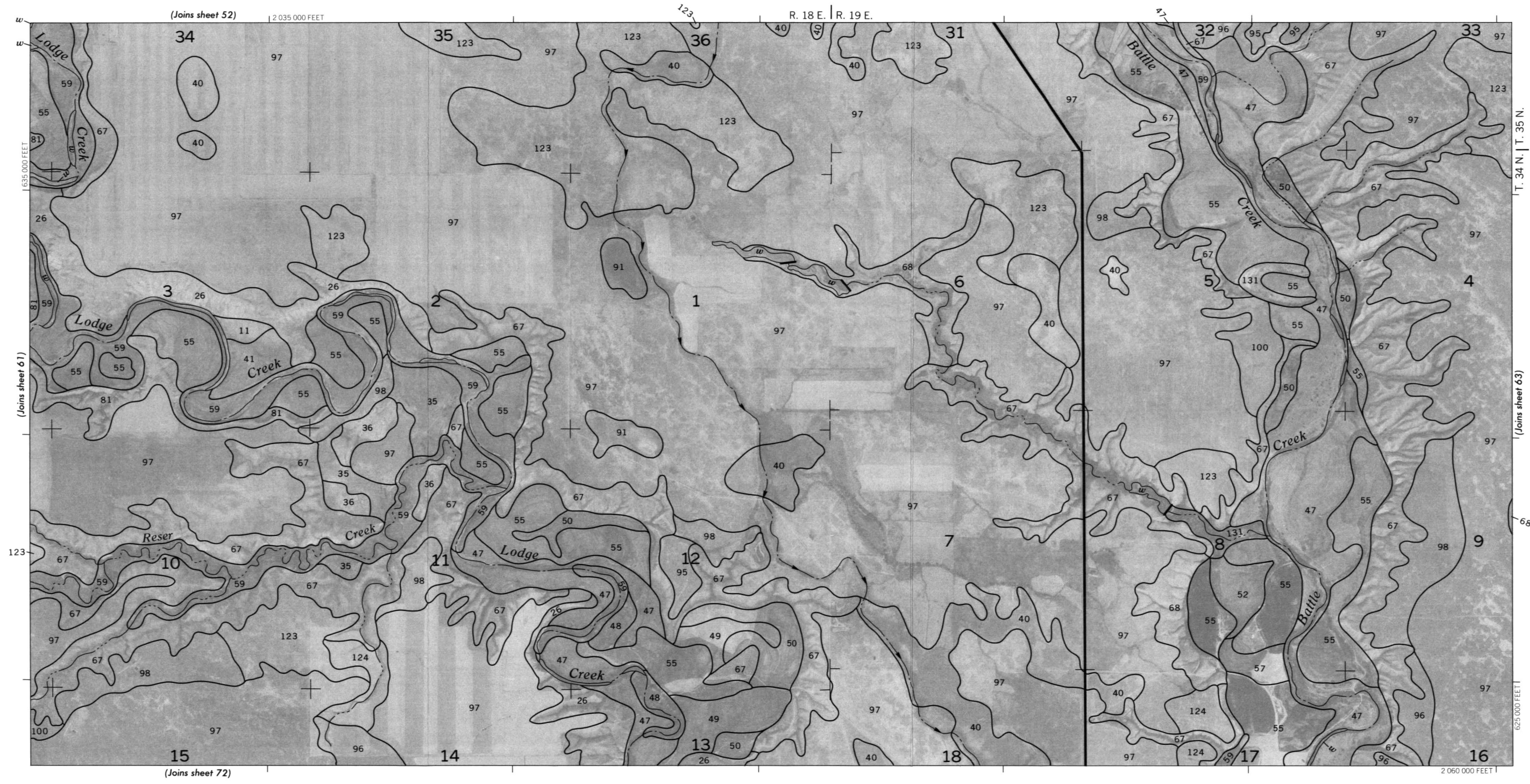




Coordinate grid ticks and land division corners, if shown, are approximately positioned.

Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

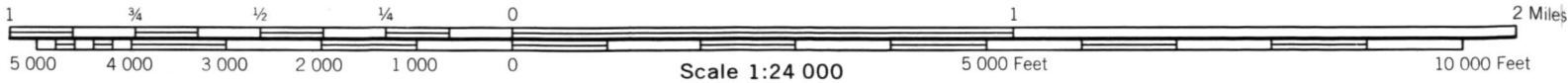
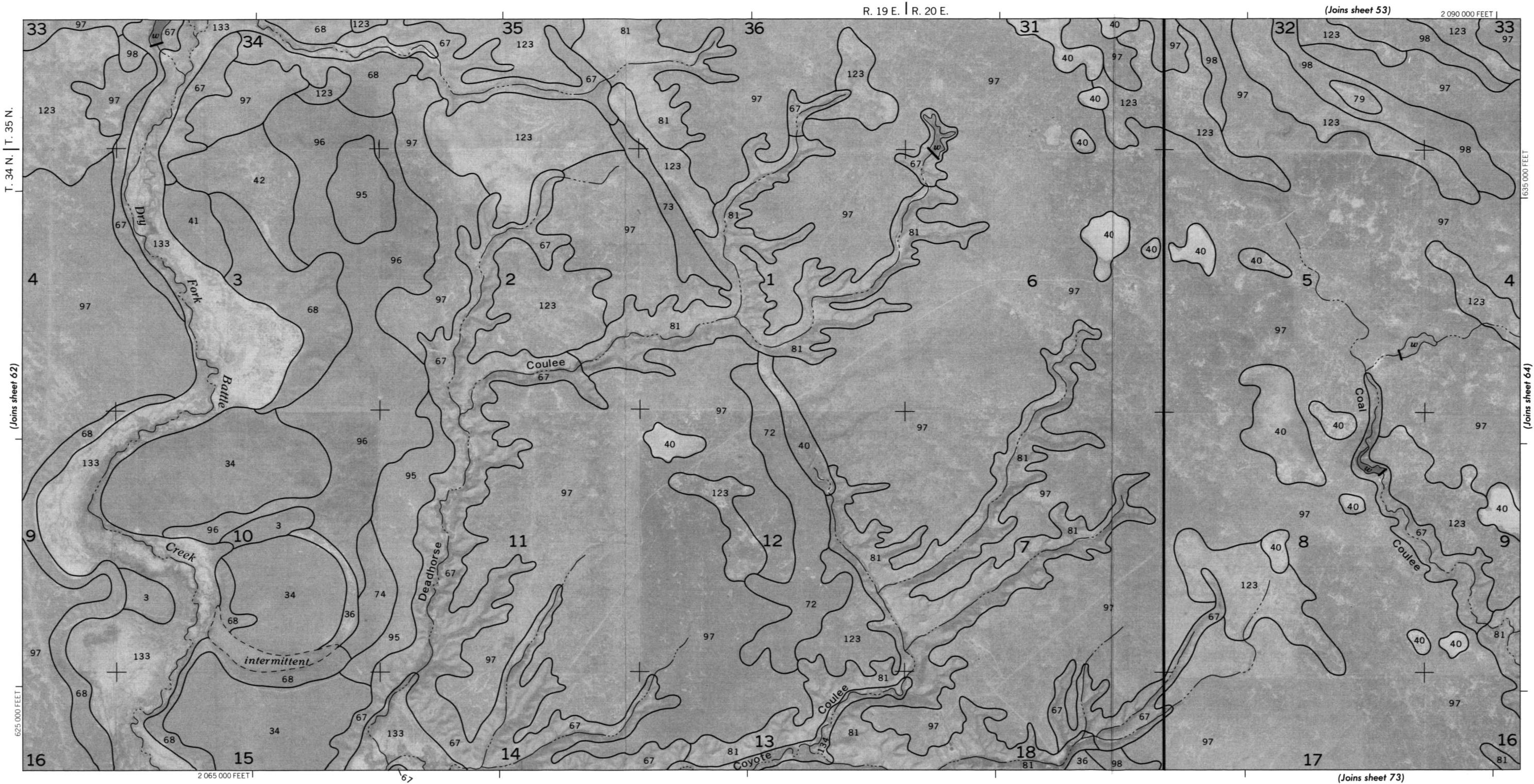


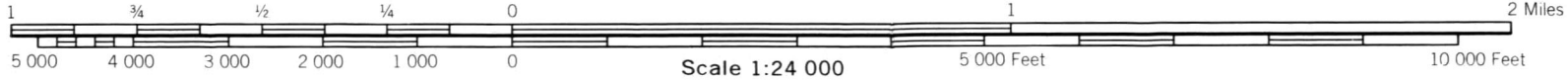
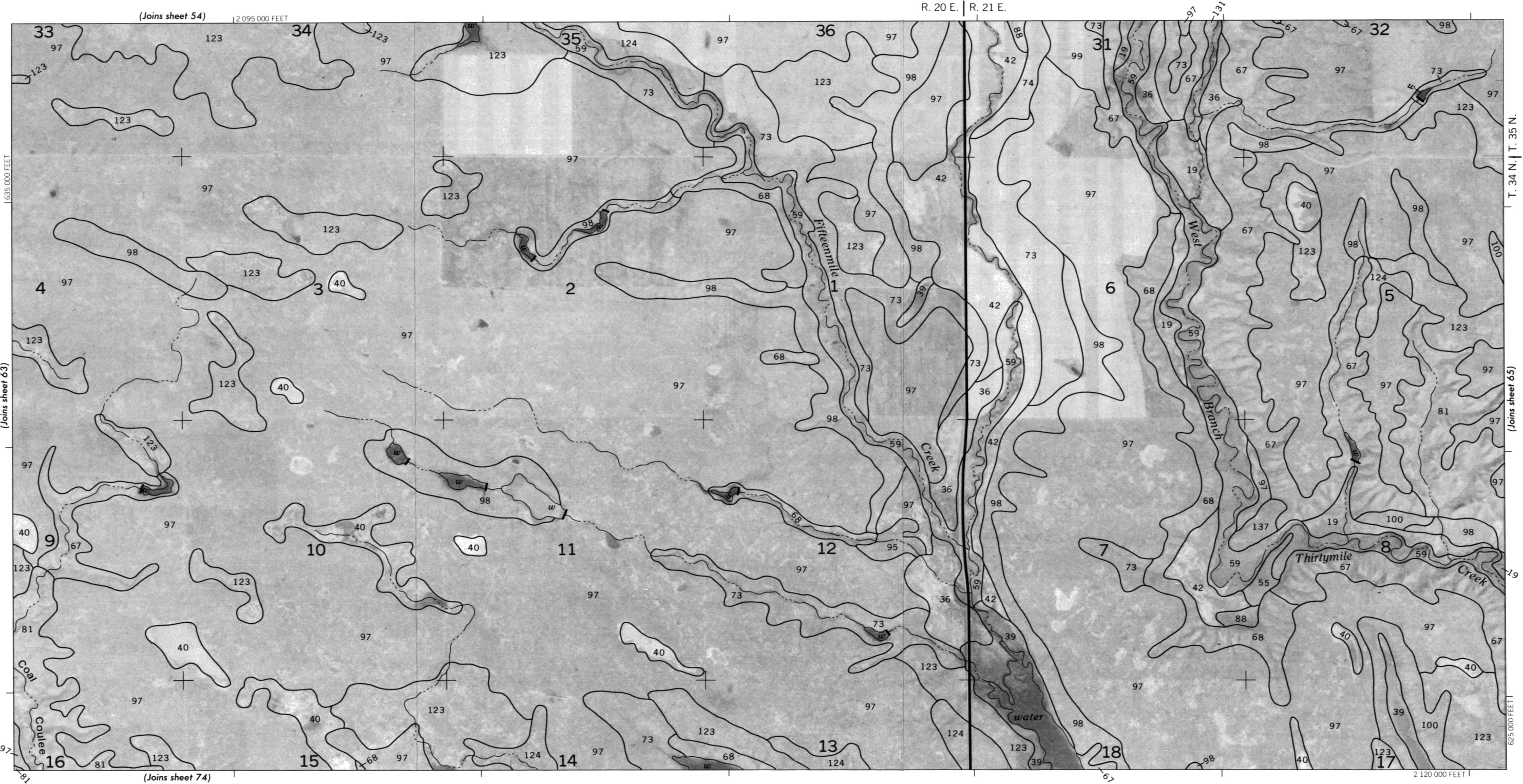


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 63

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

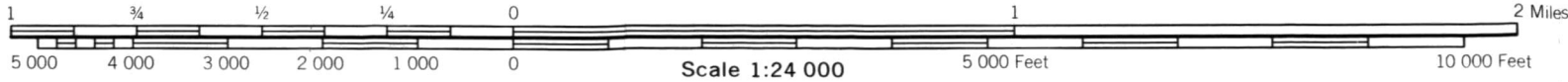
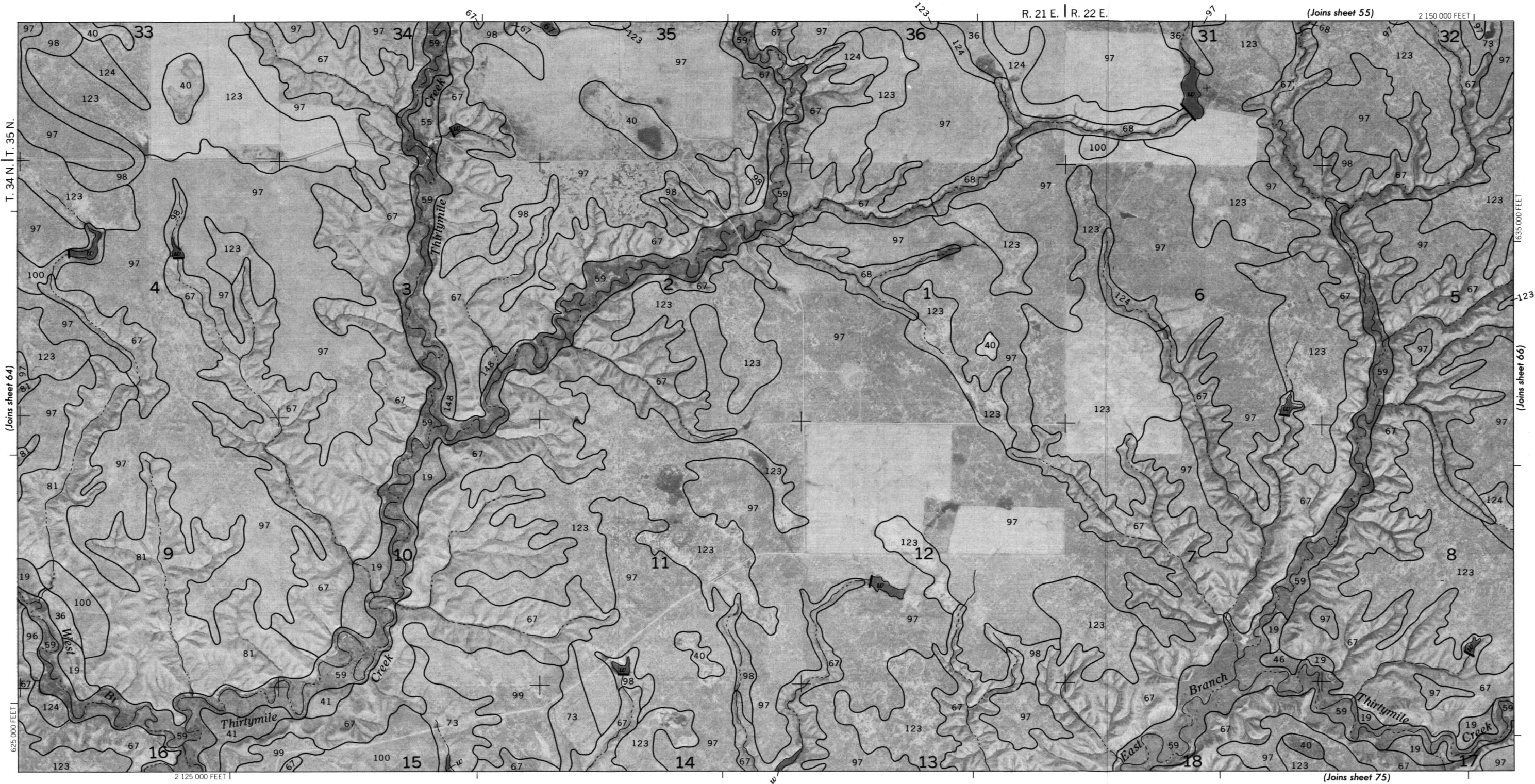


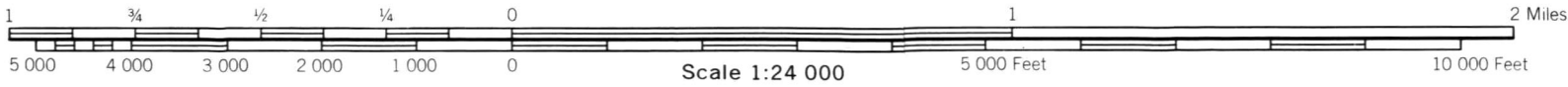
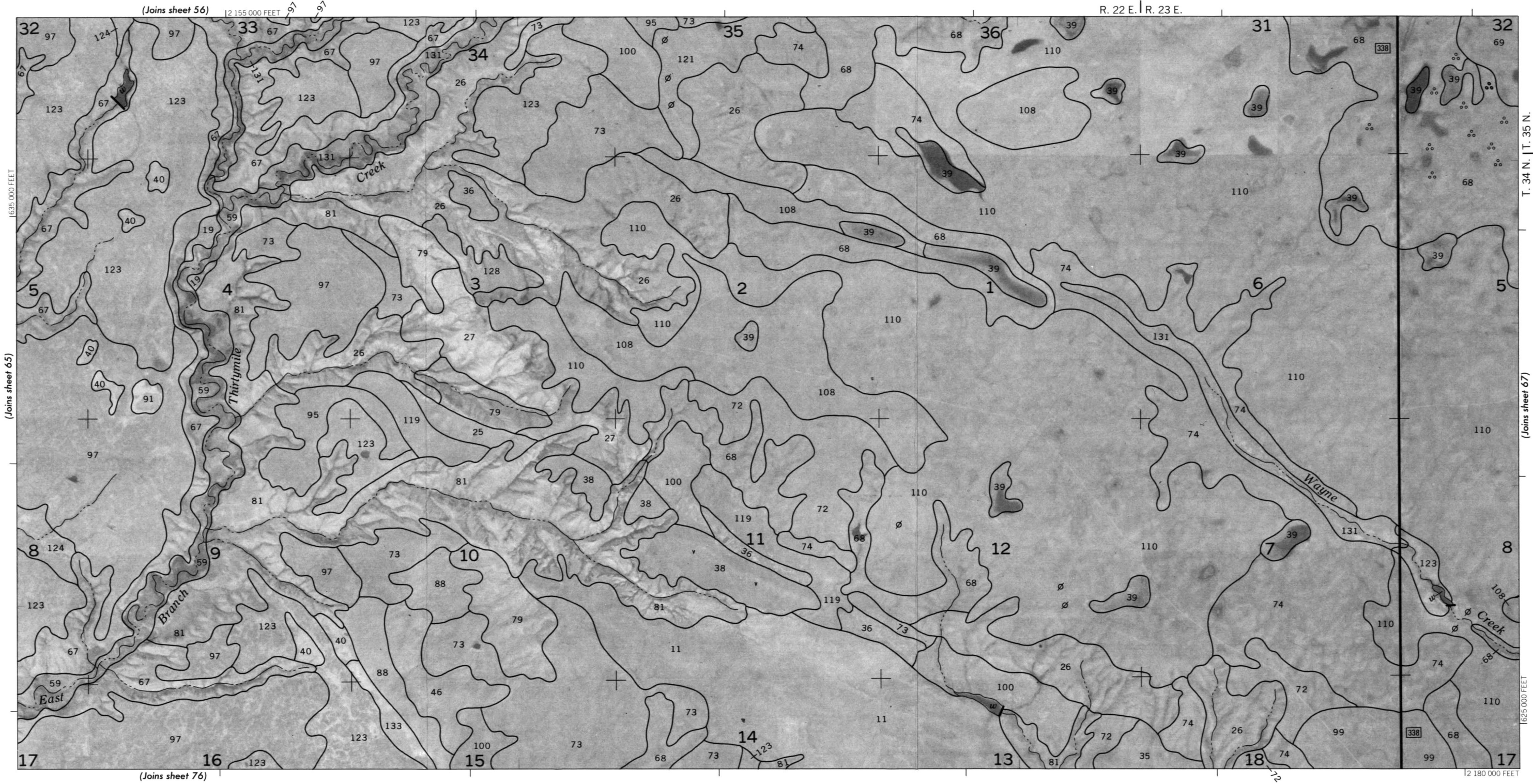


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 65

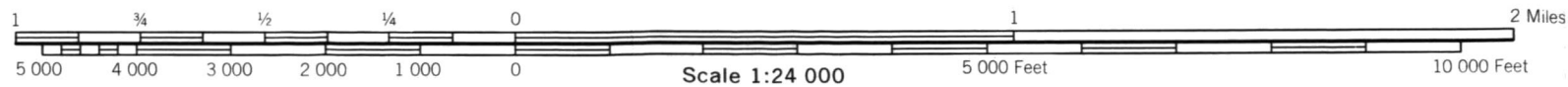
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

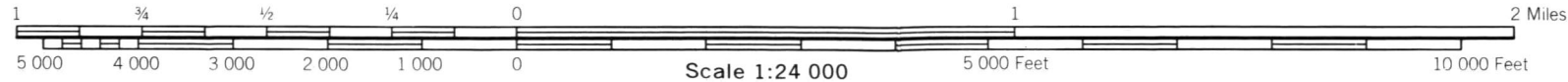
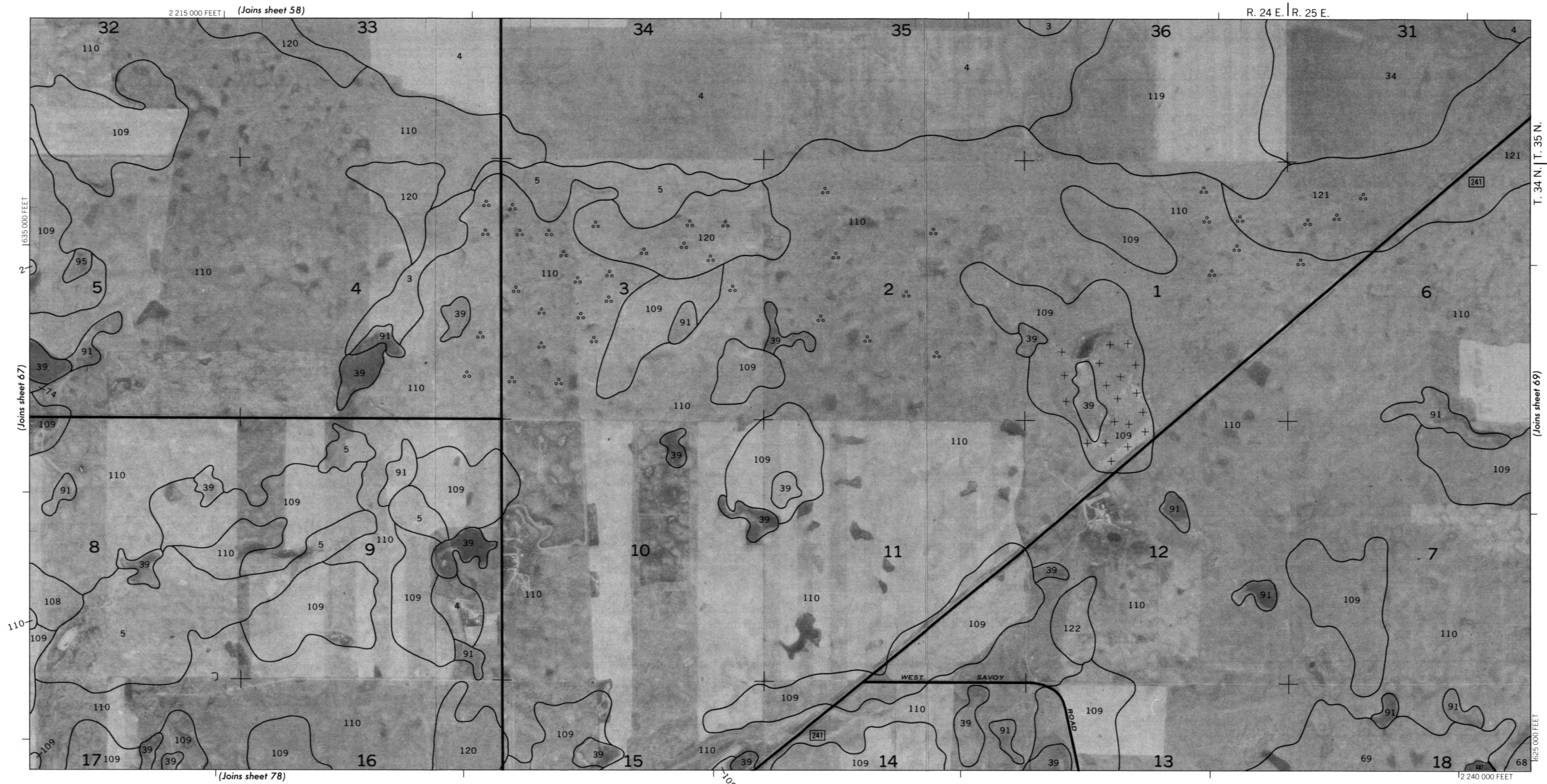




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

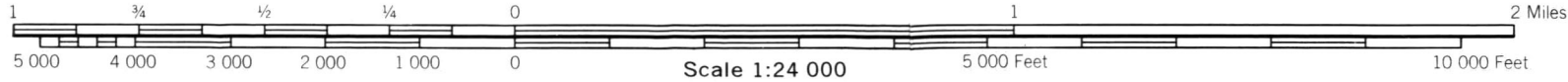
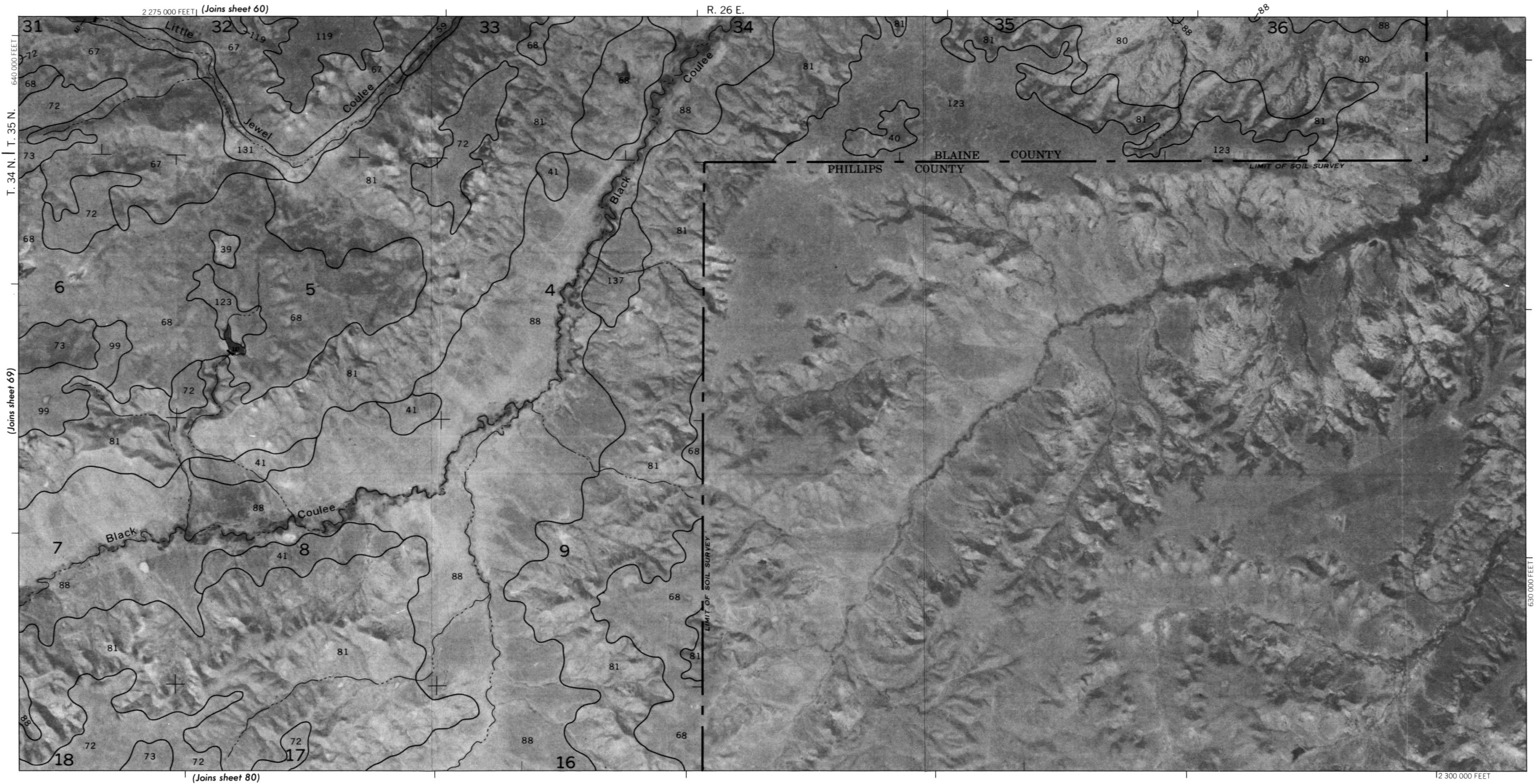




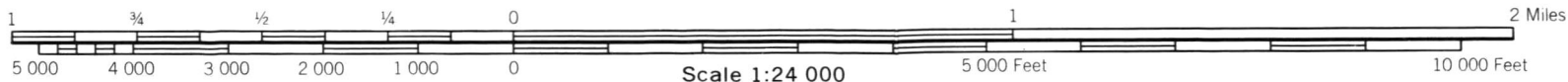
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



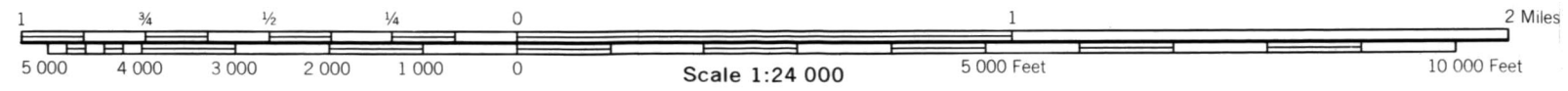
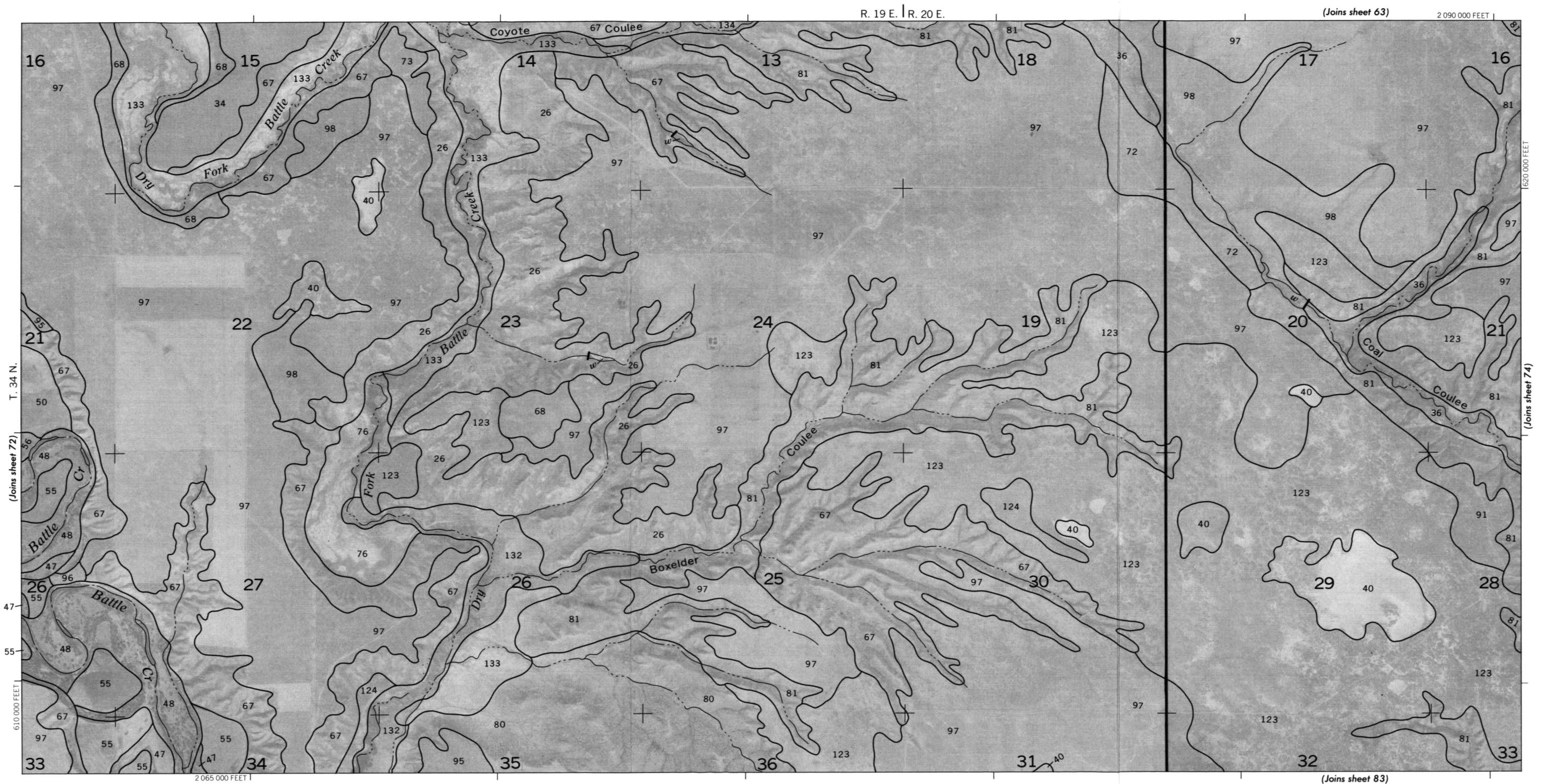
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 70

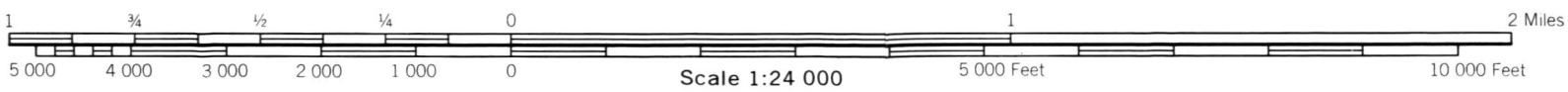
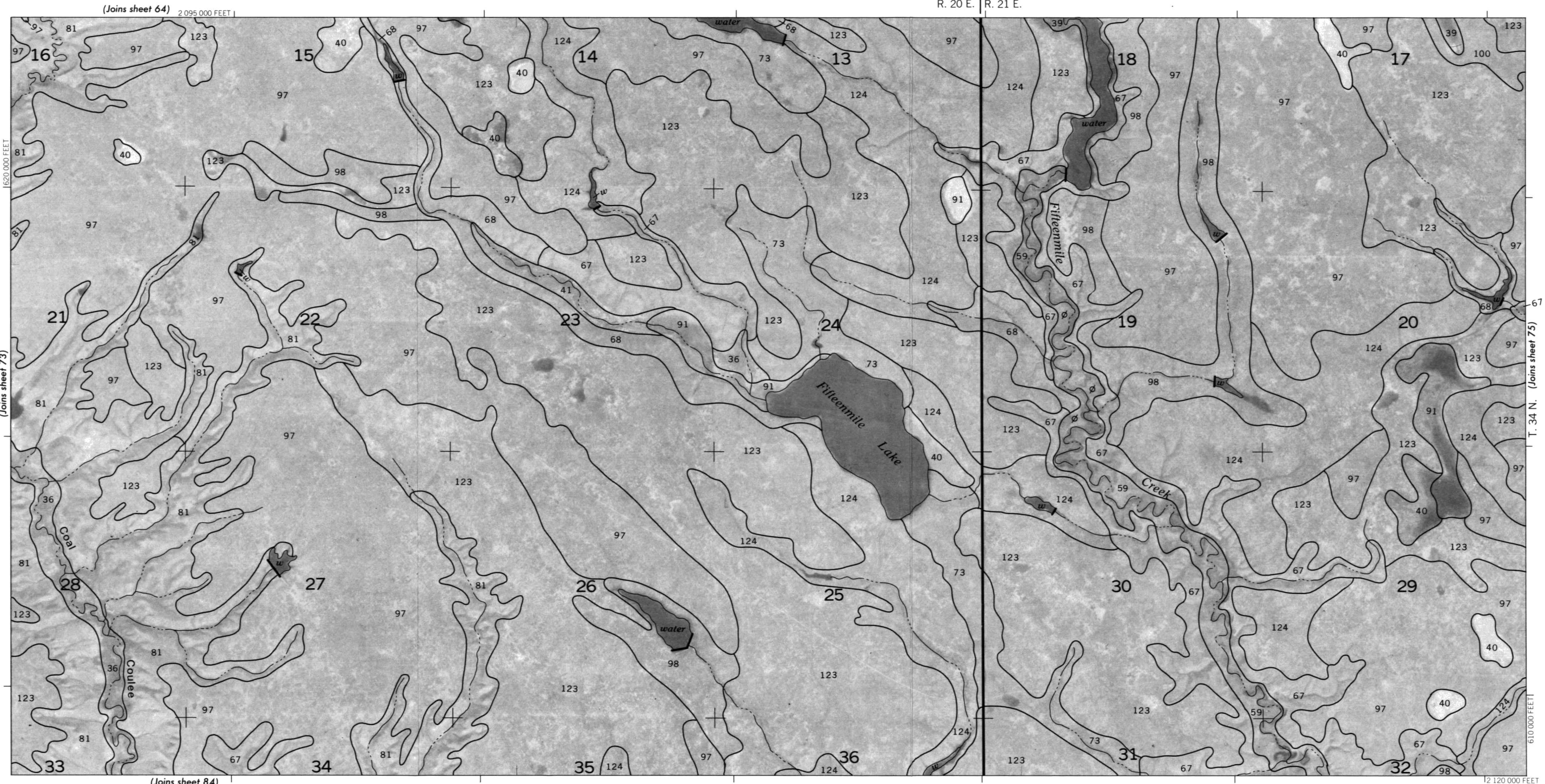


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

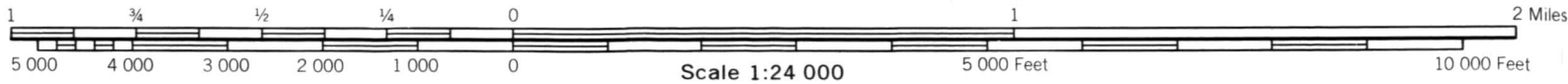
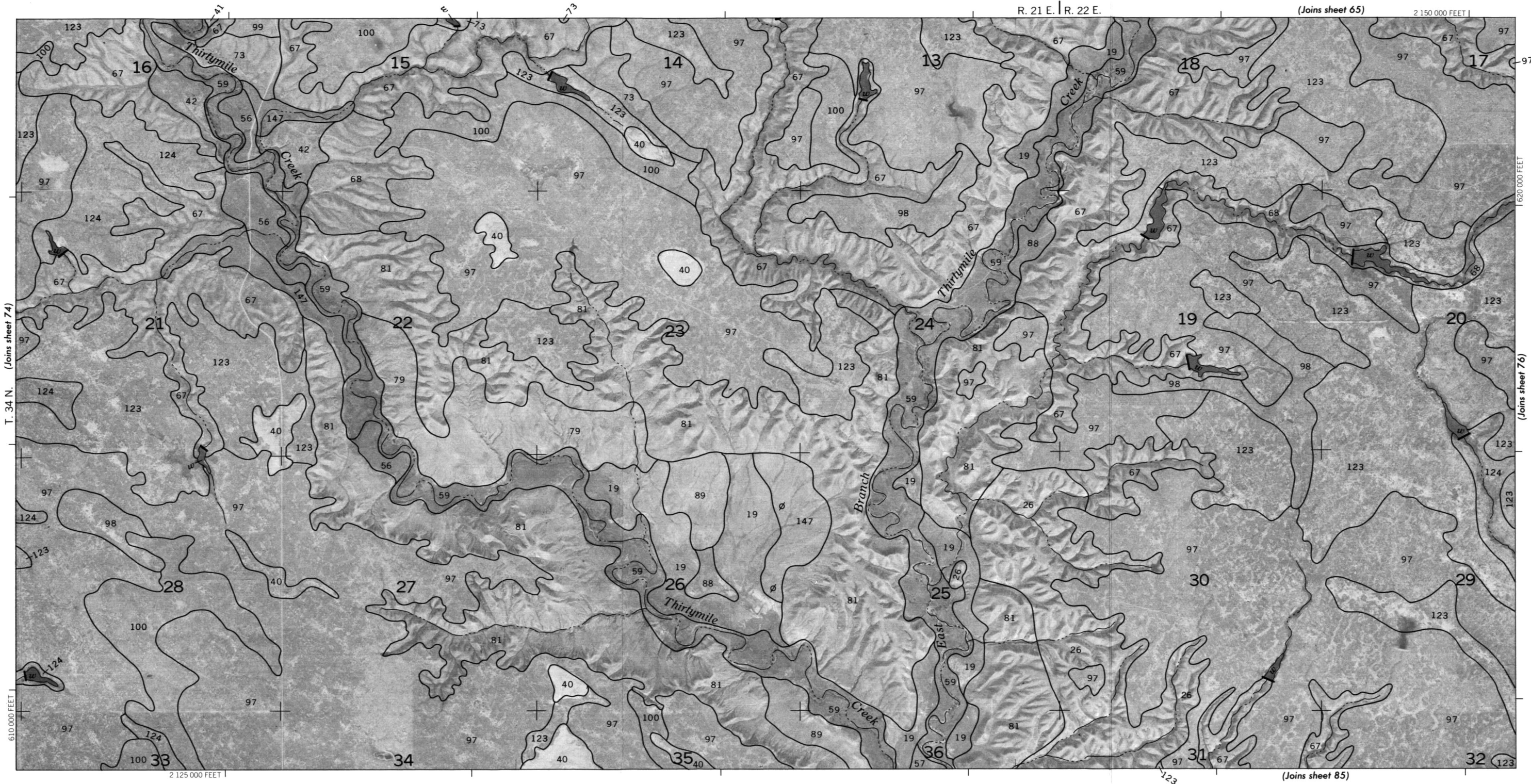


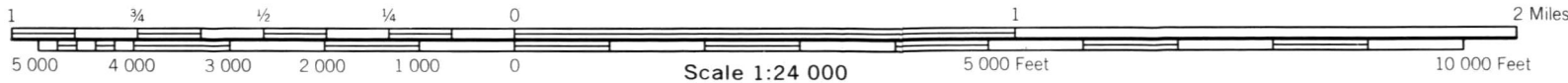
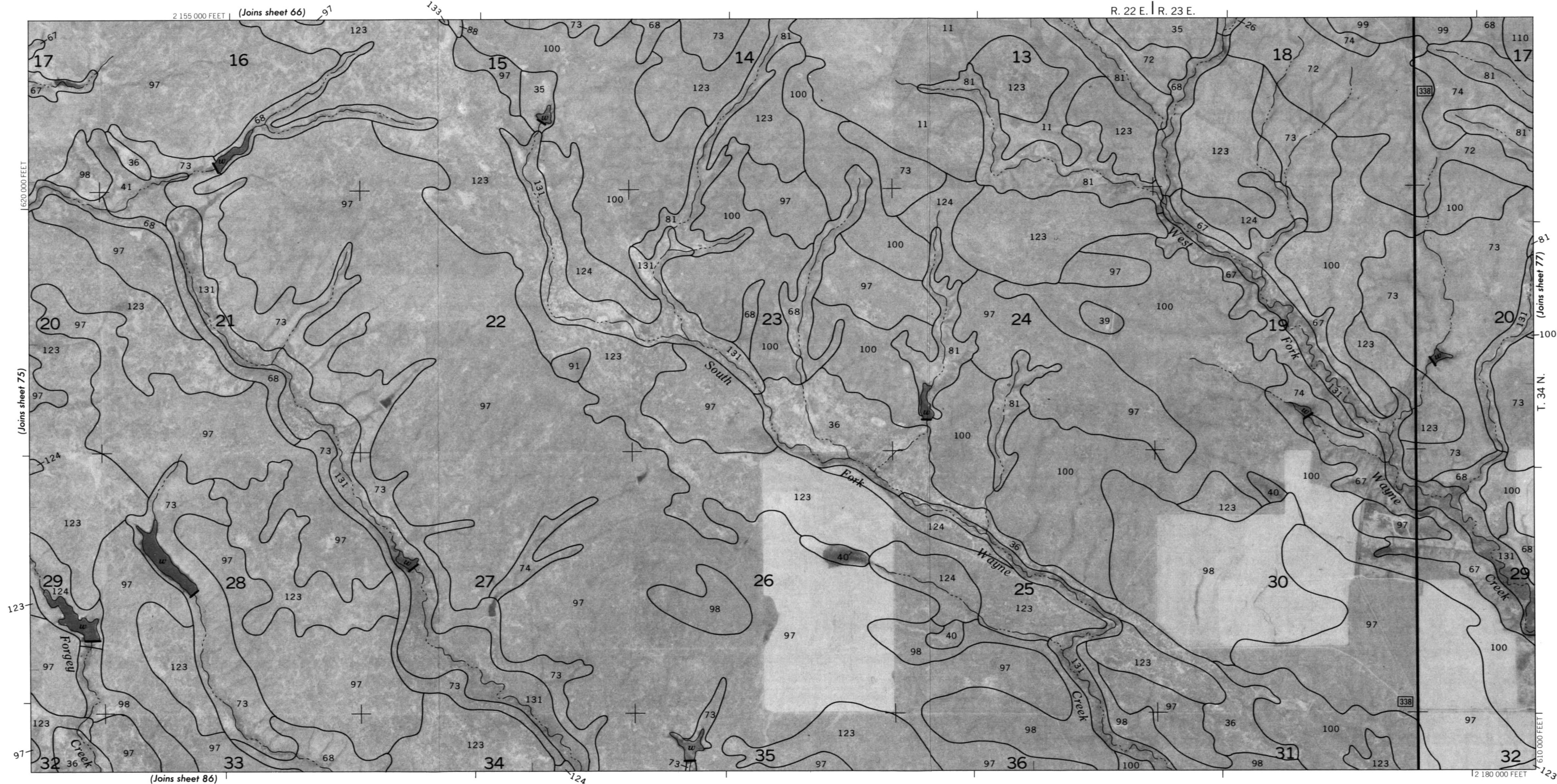


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 75

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

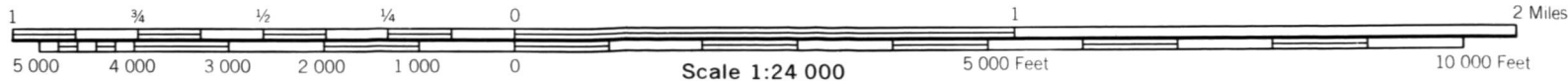




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 77

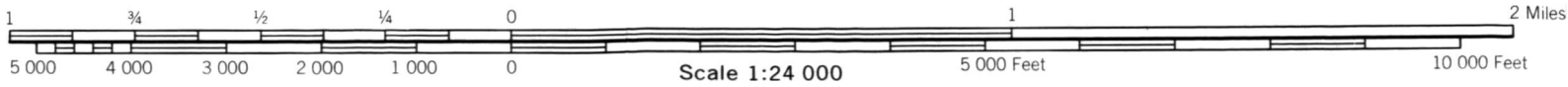
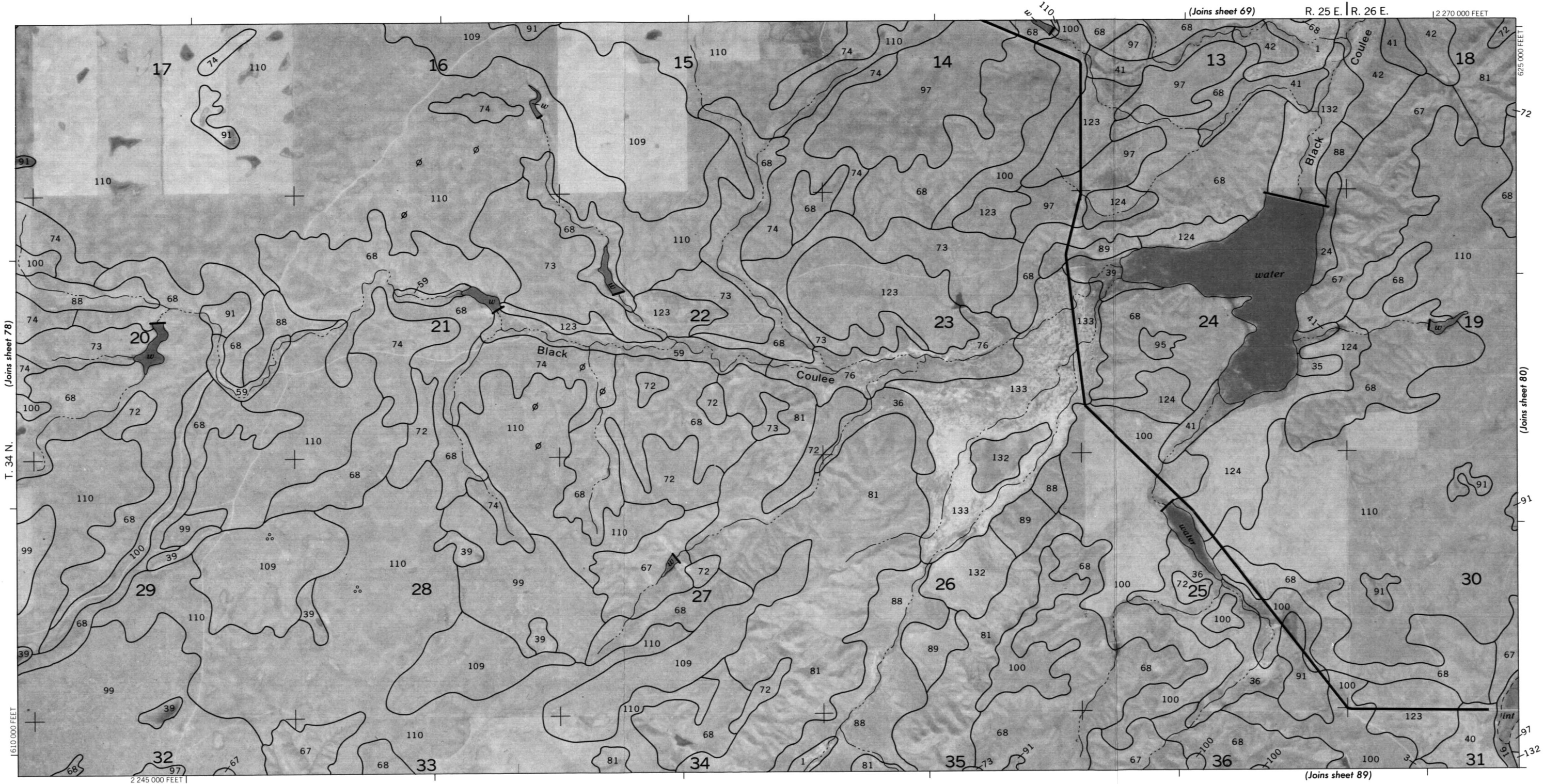
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





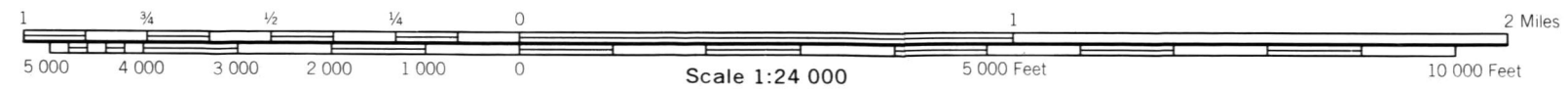
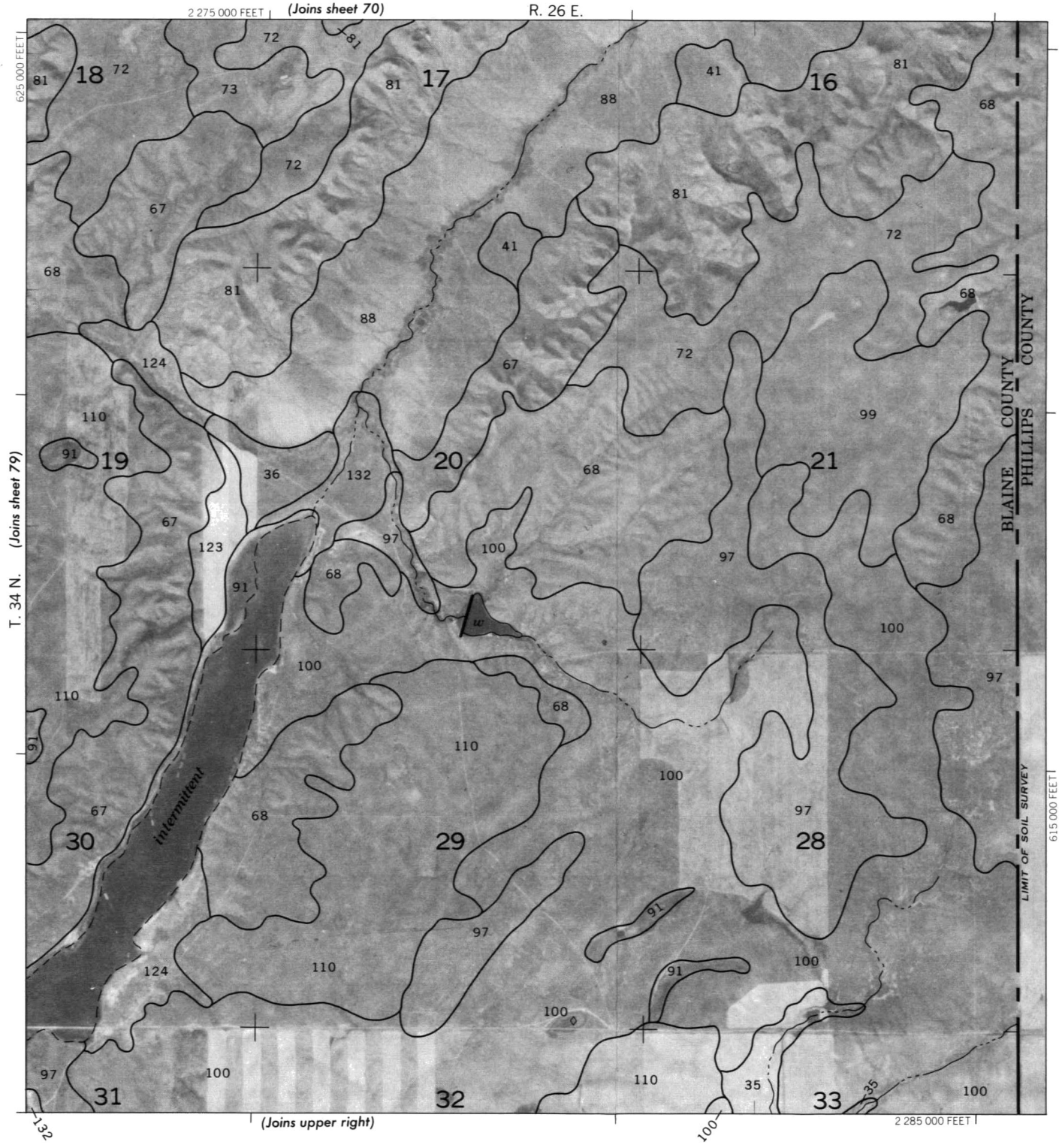
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 79

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

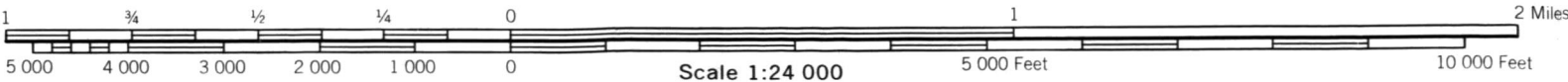
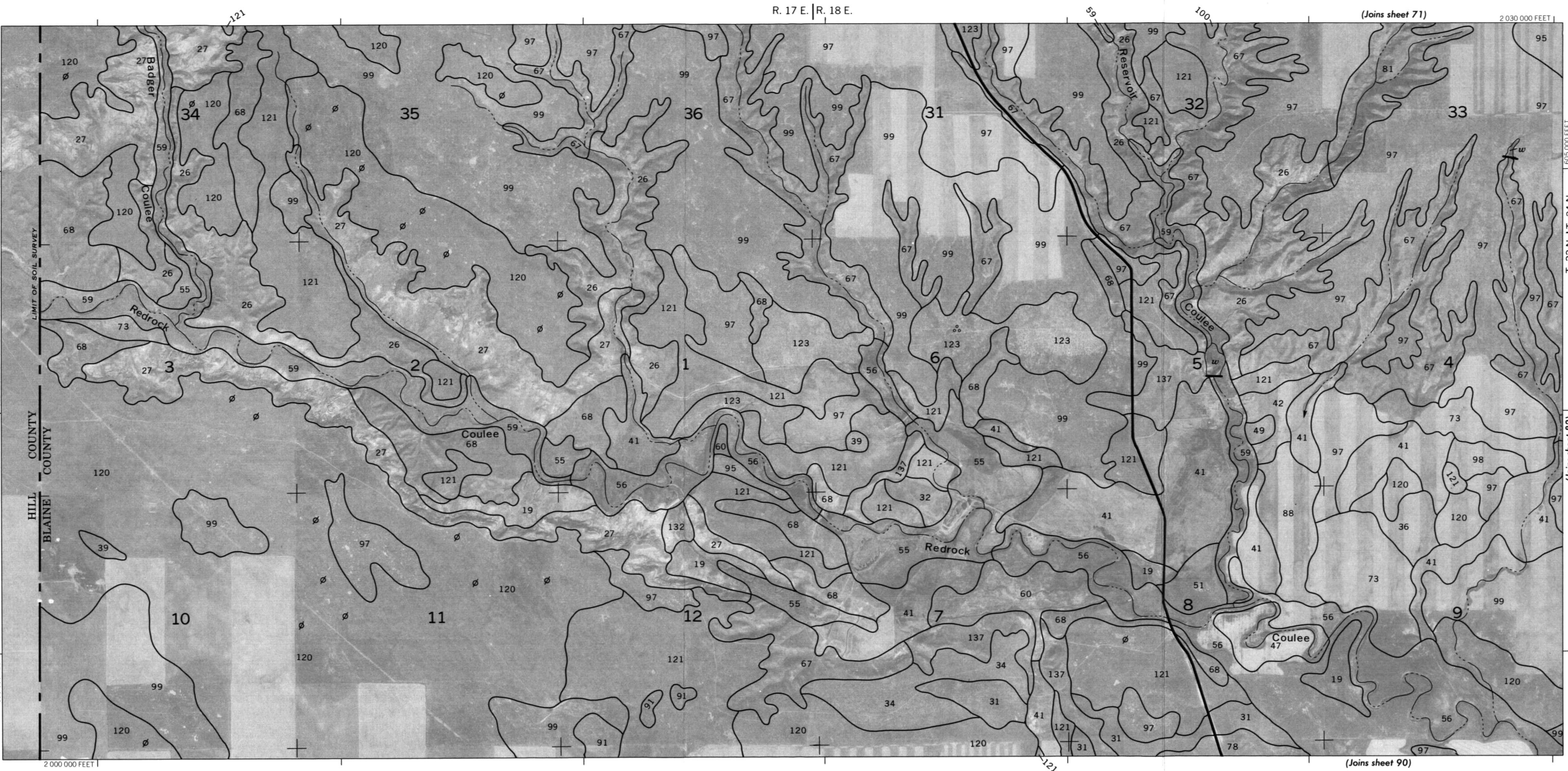




SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 80



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

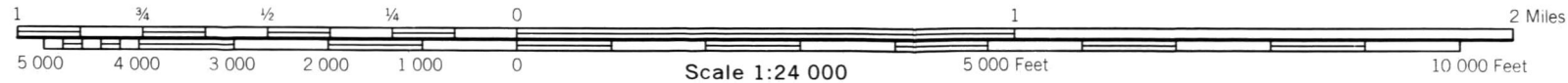


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 81

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

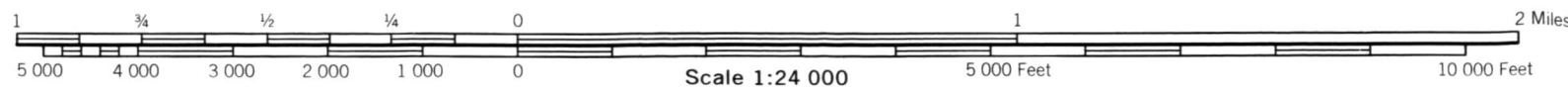
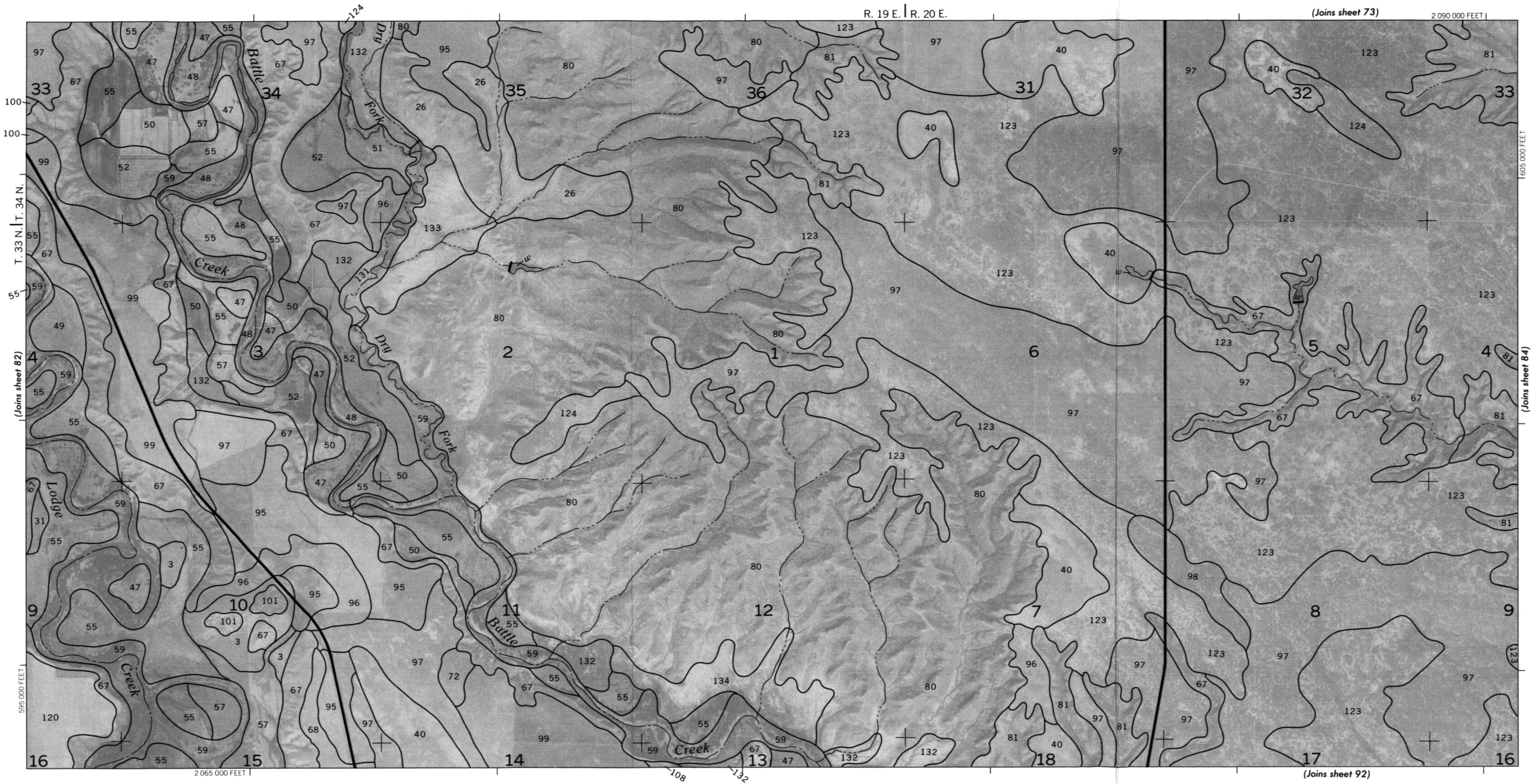


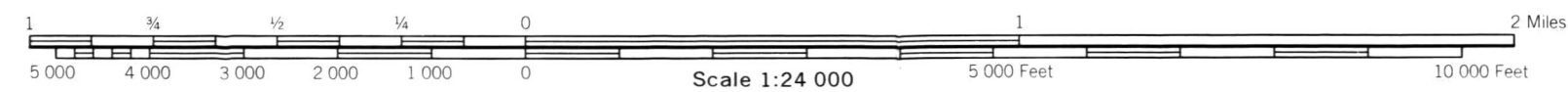
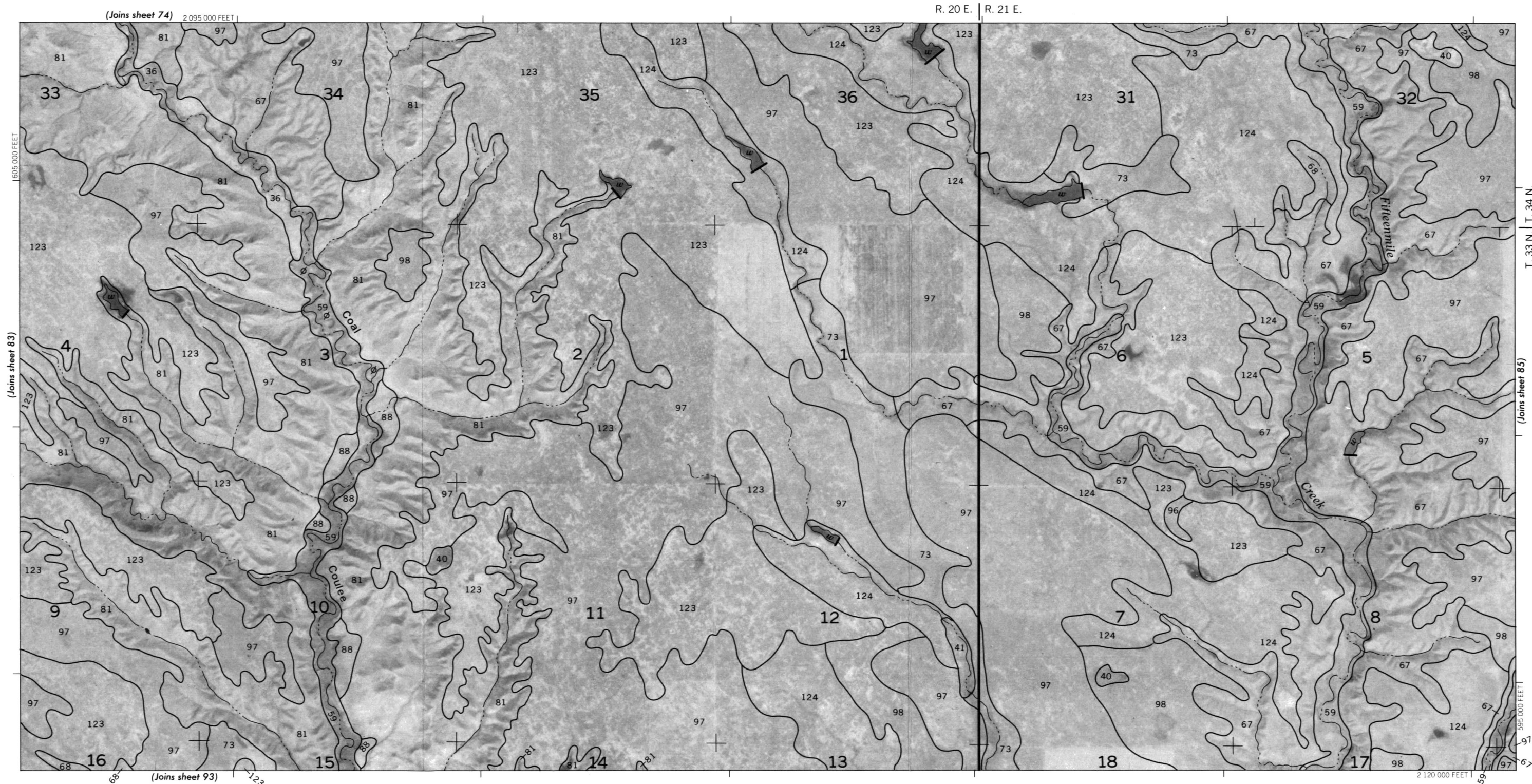
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 82



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

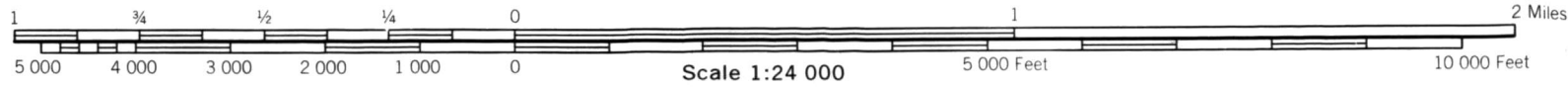
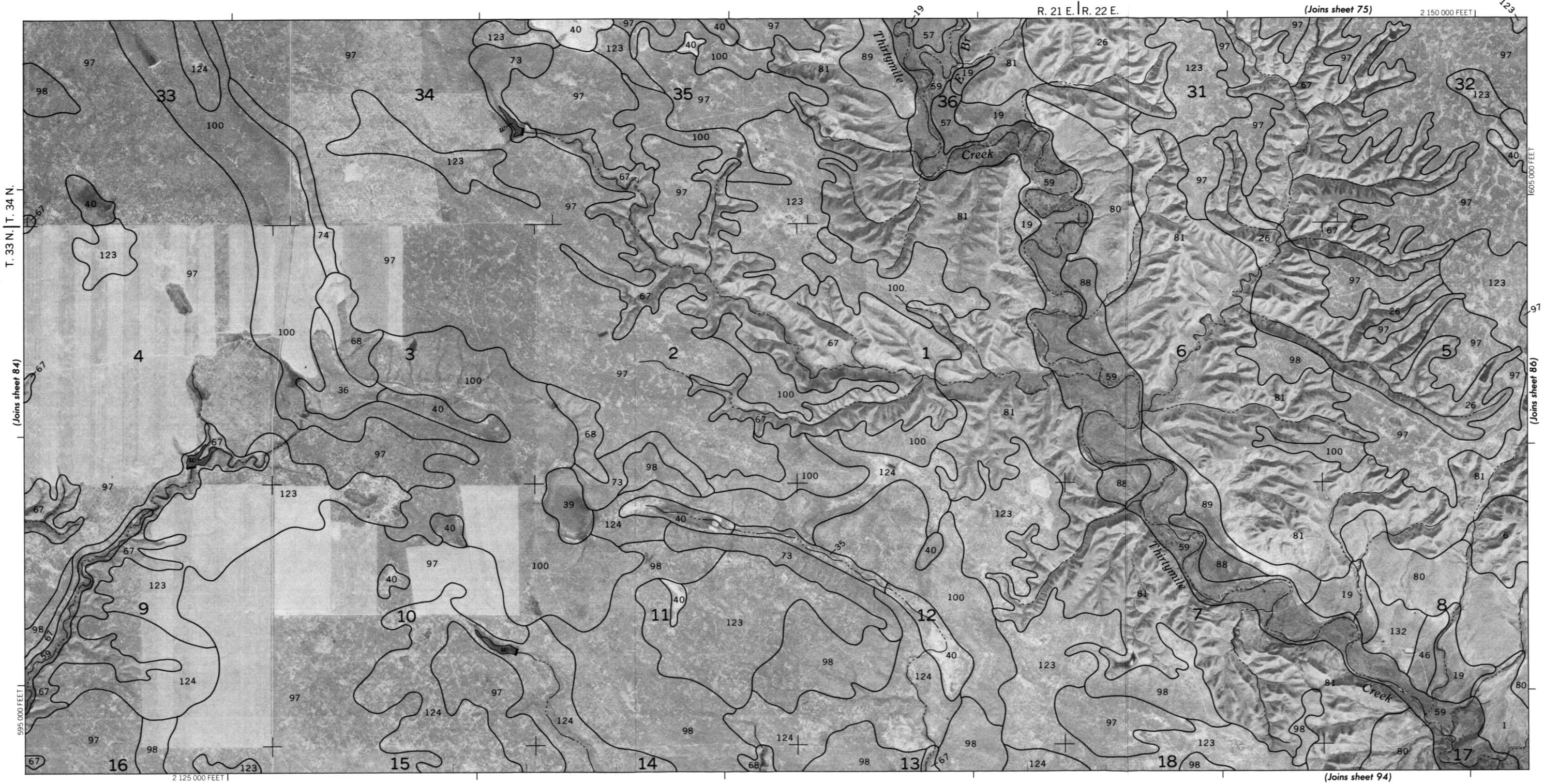
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

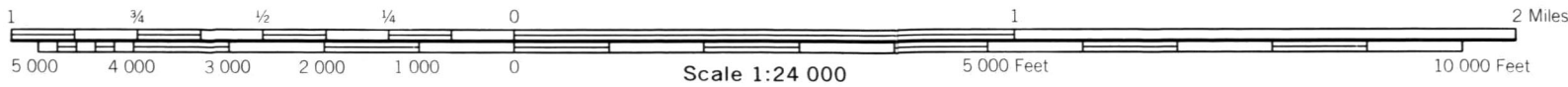
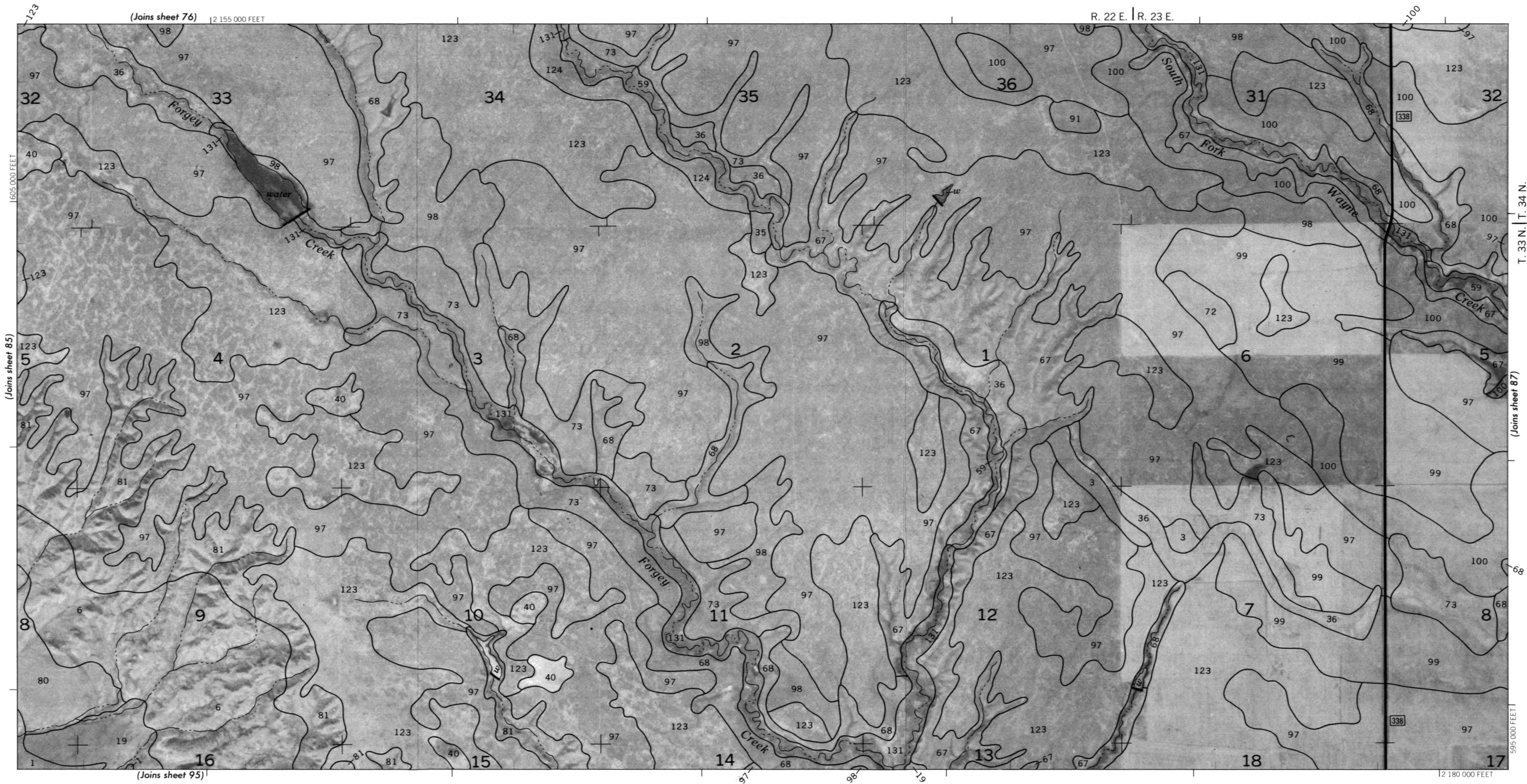




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

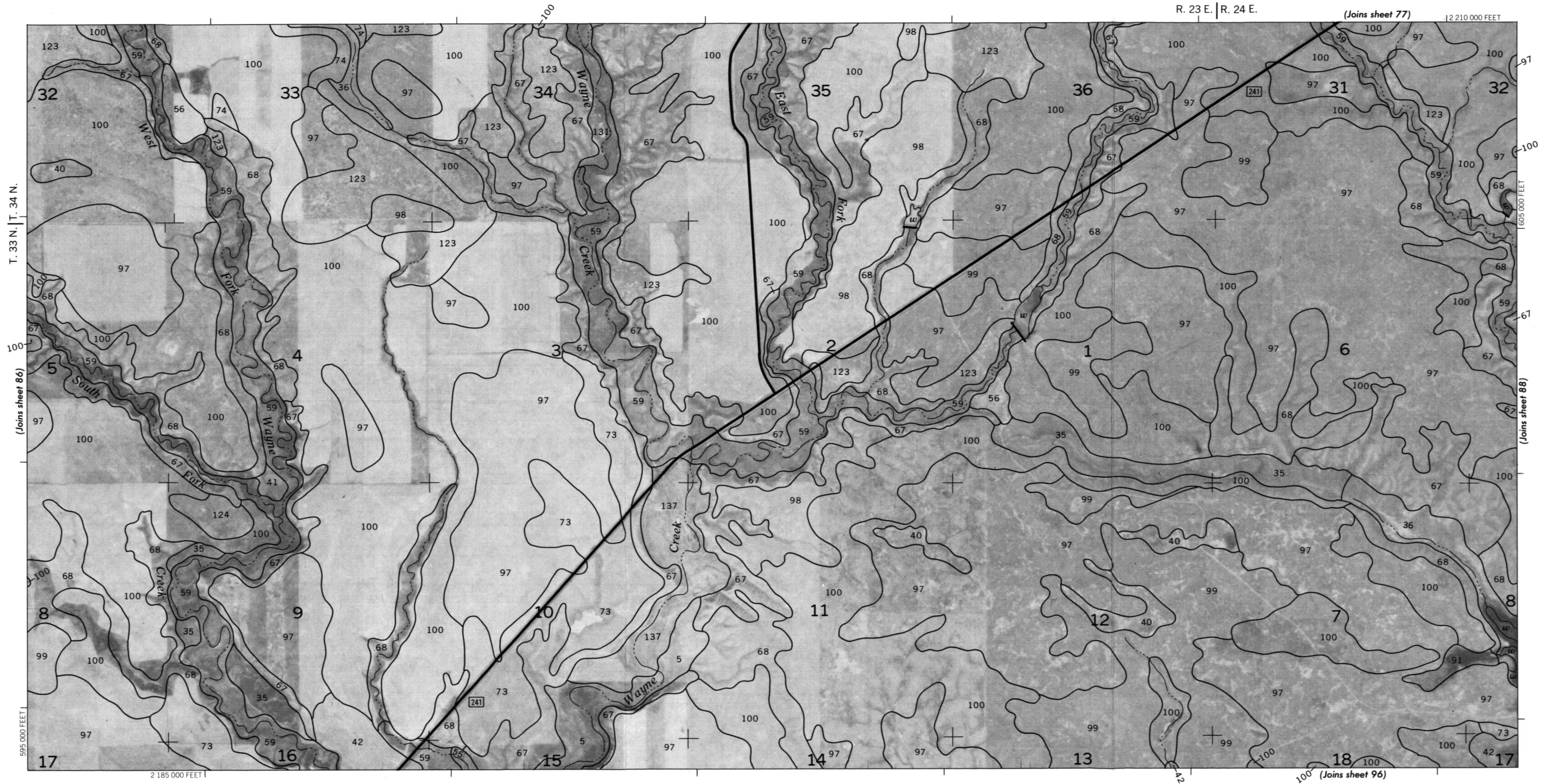




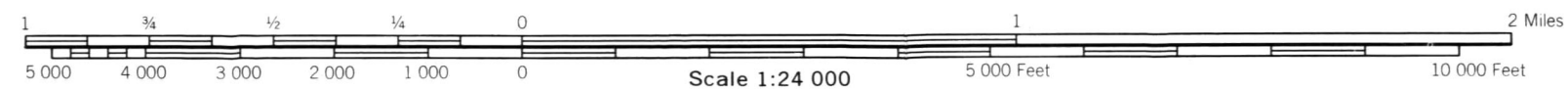
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 87

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



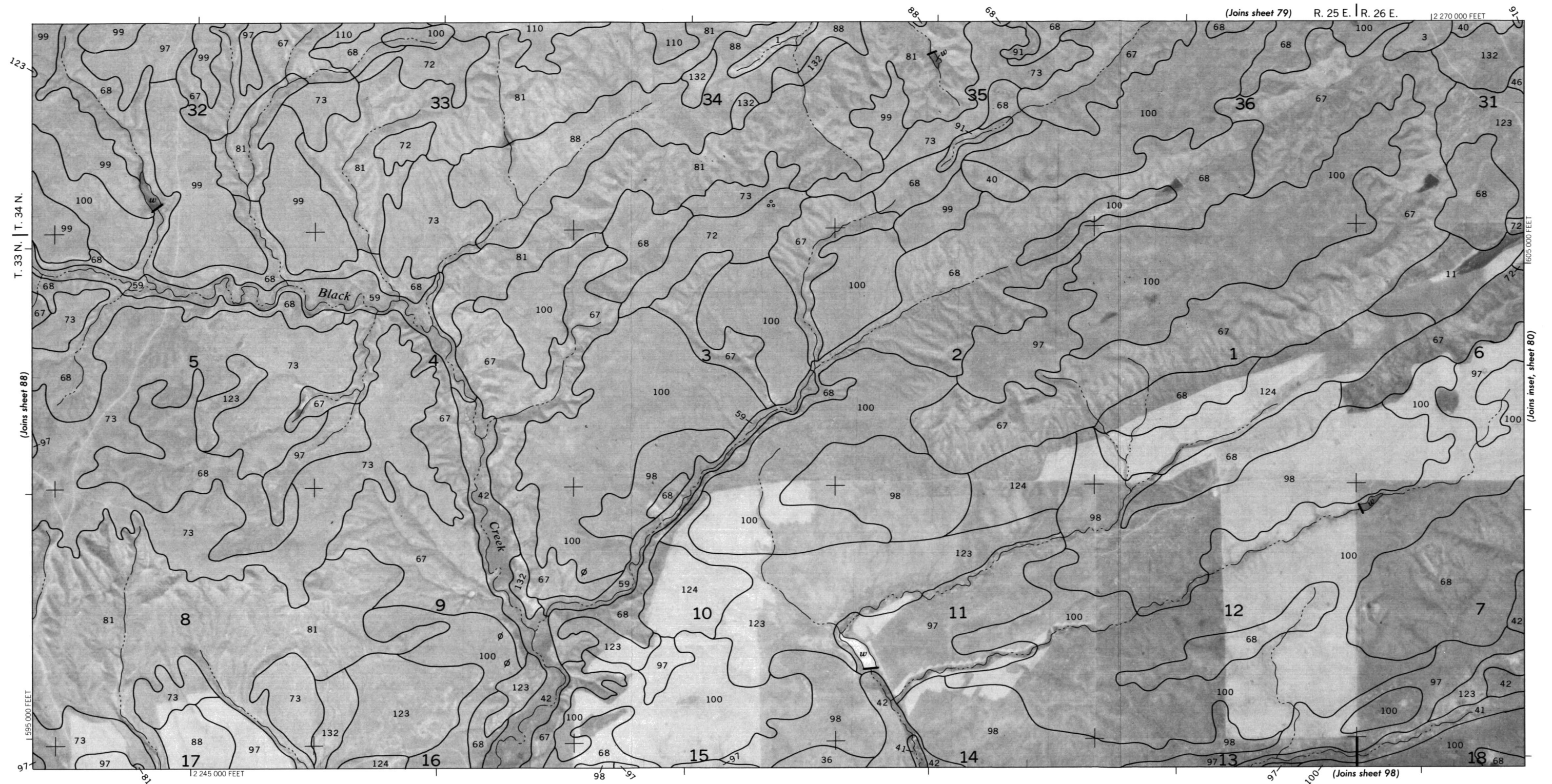
Scale 1:24 000

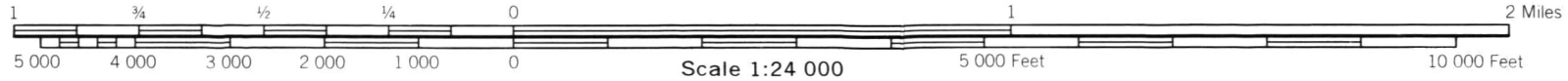
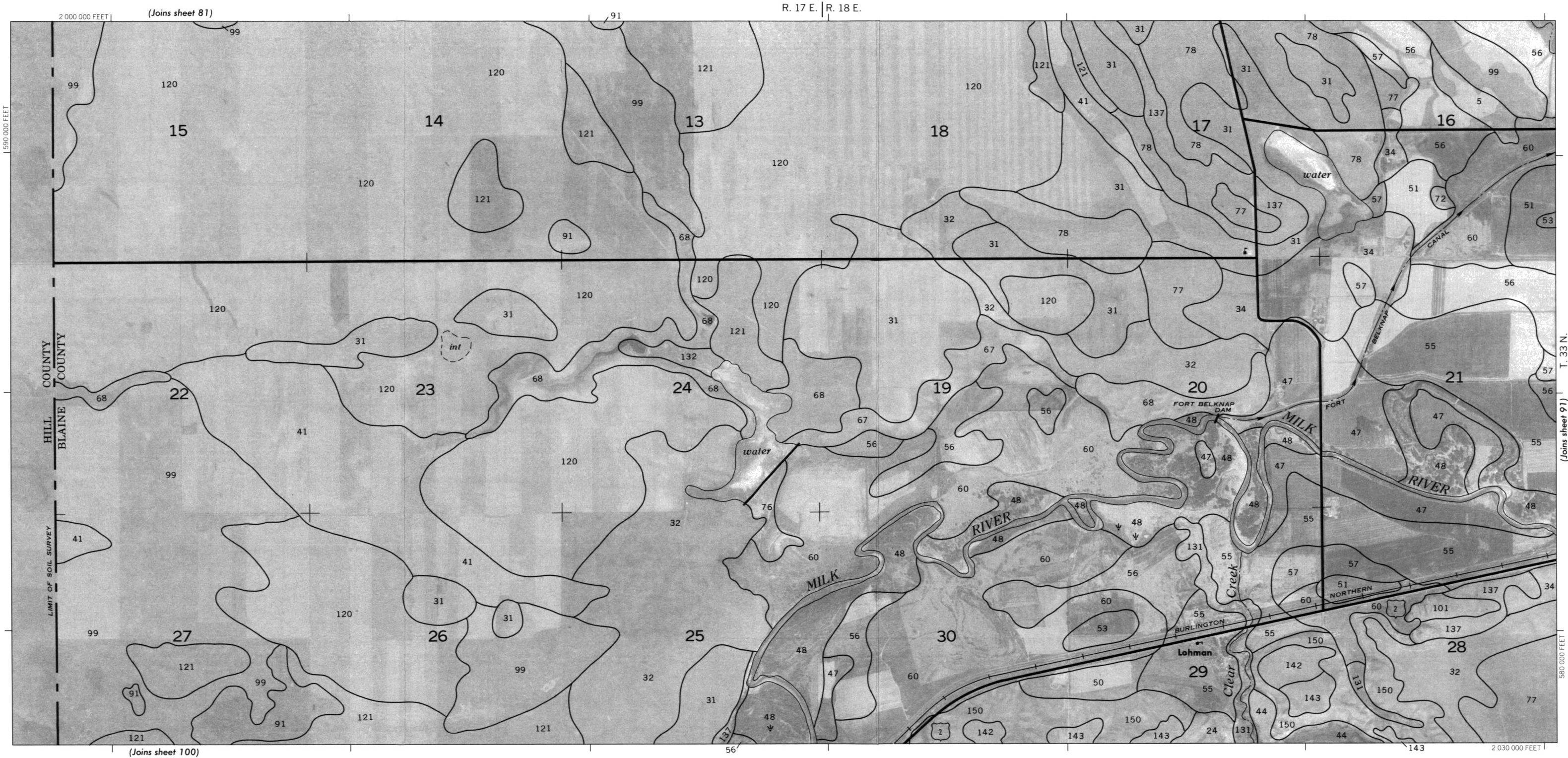


Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 88

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 89

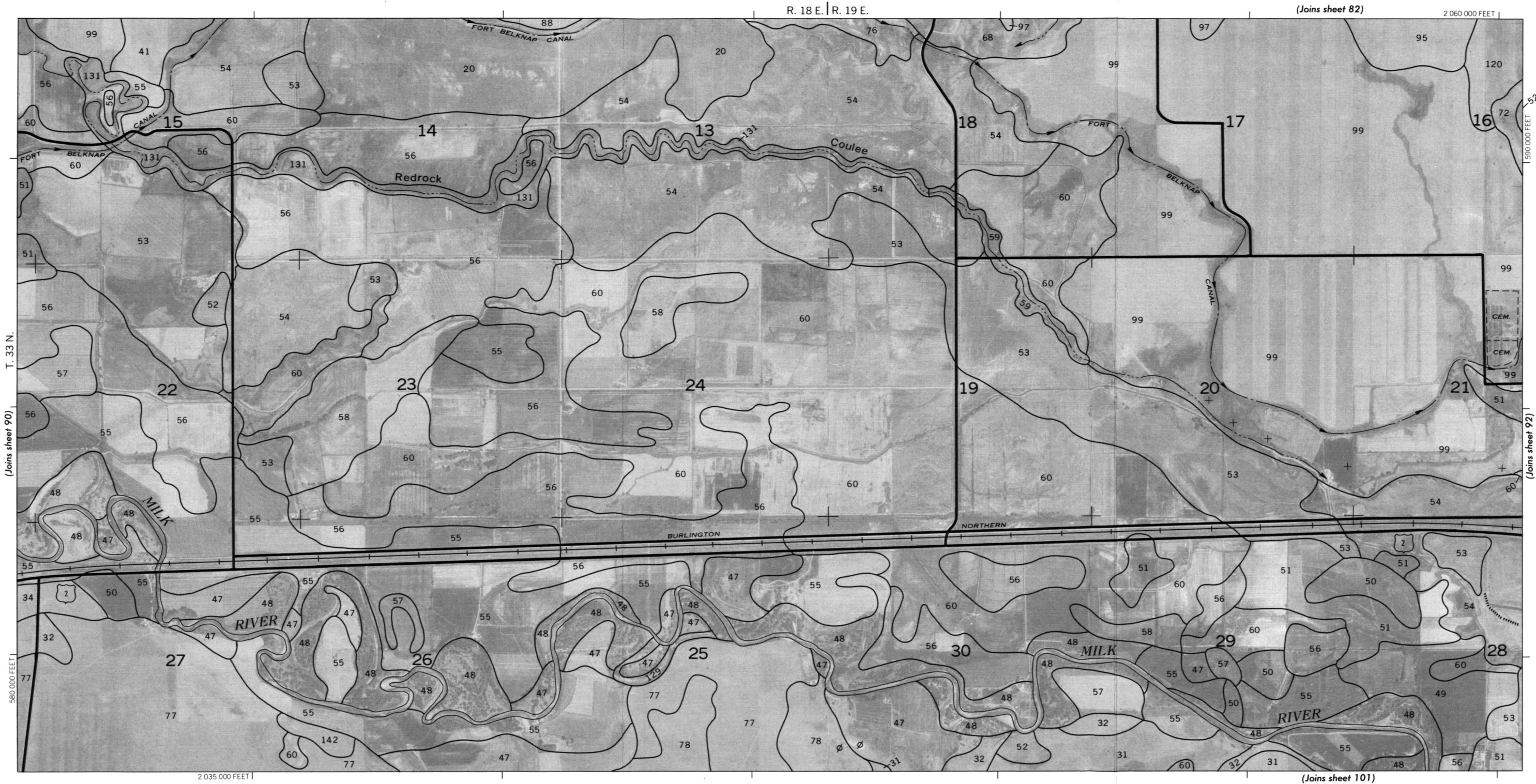


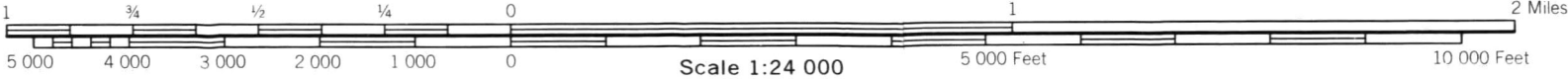


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 91

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

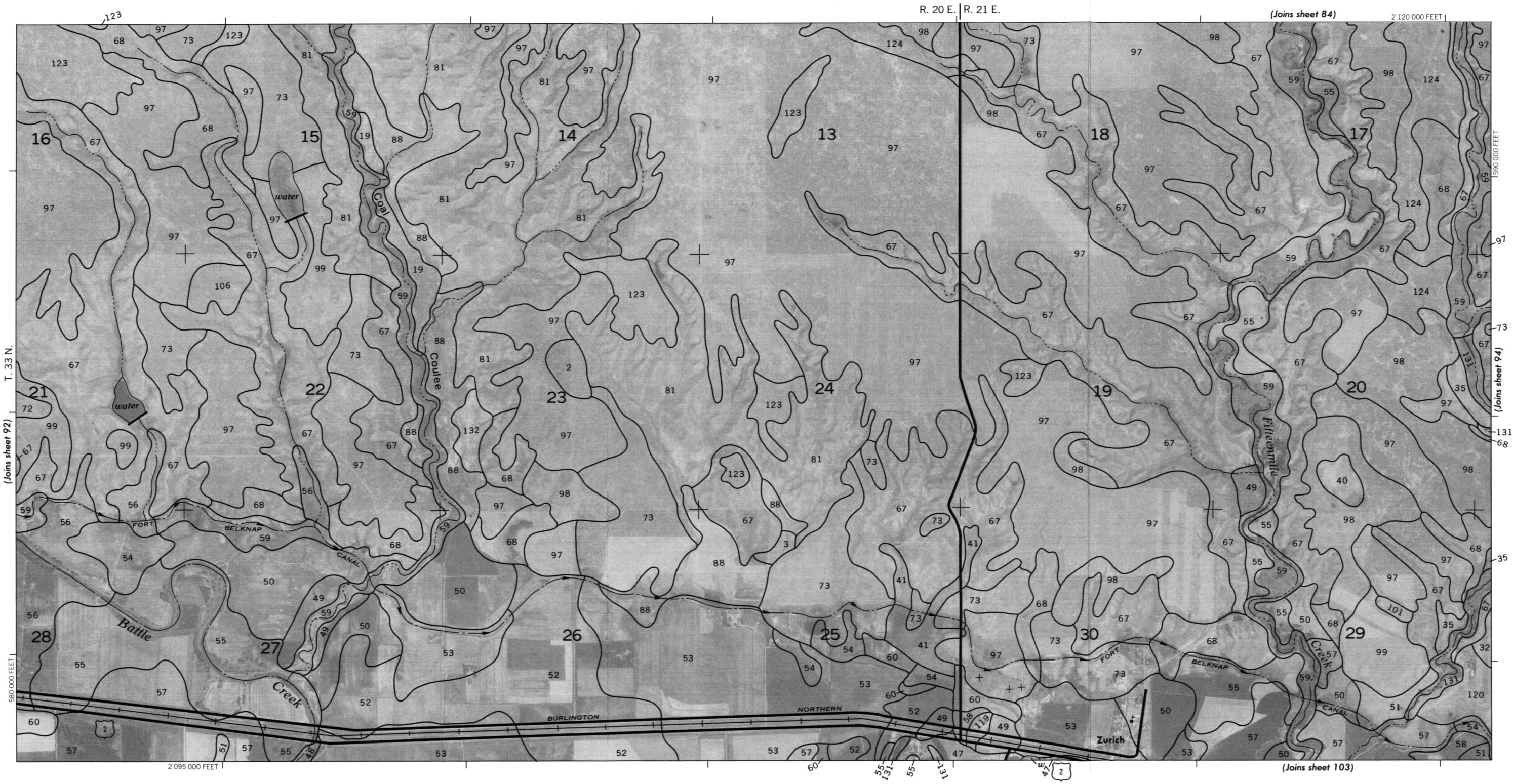


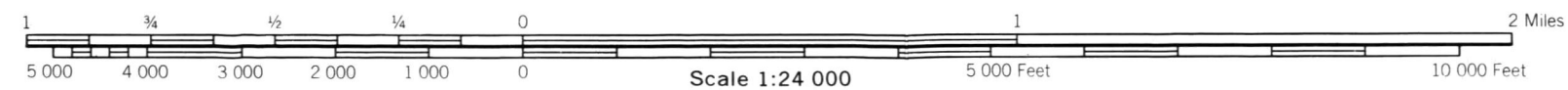
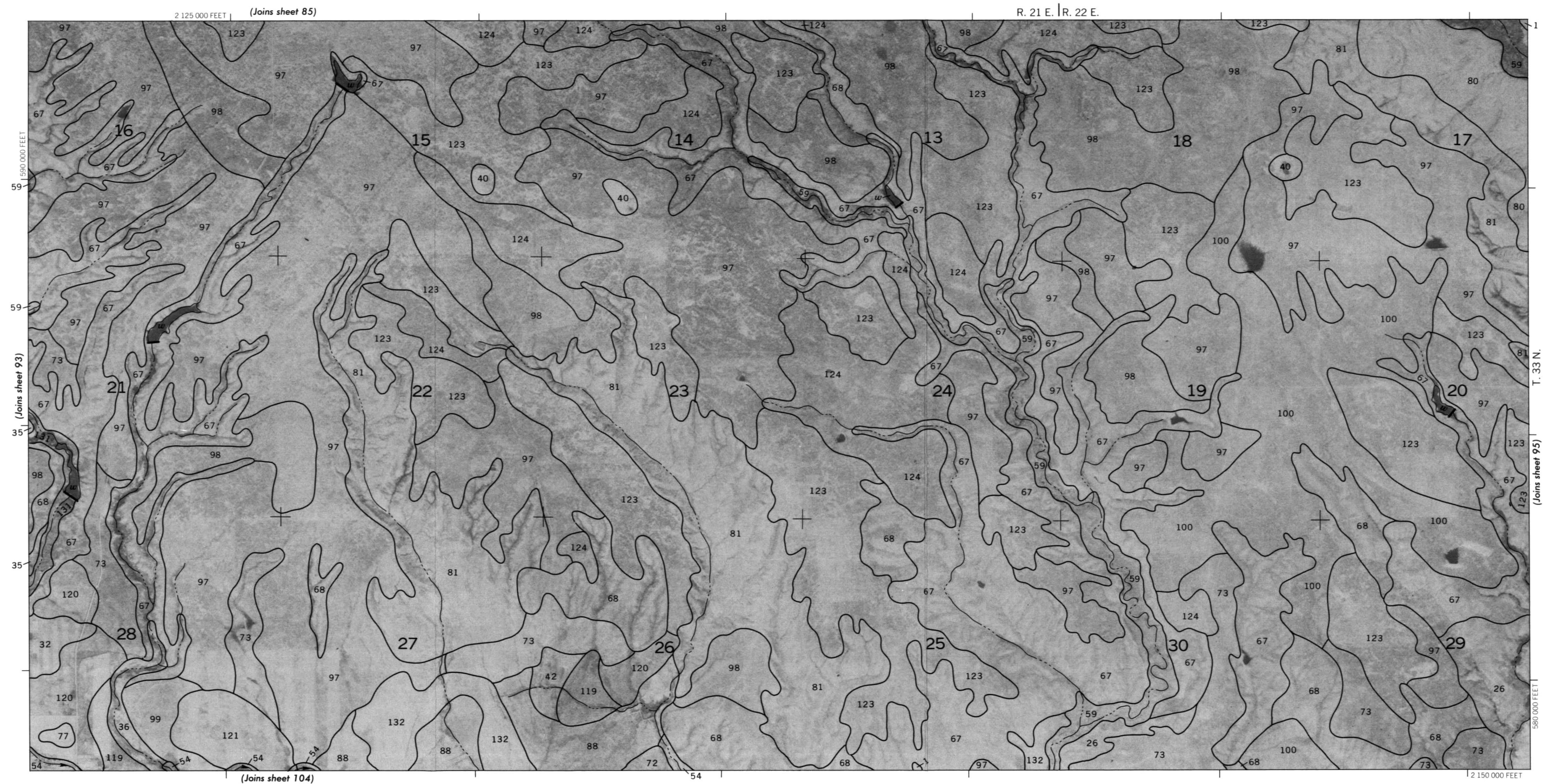


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 93

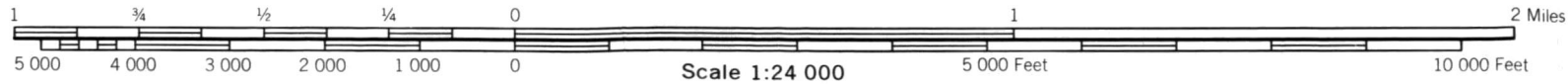
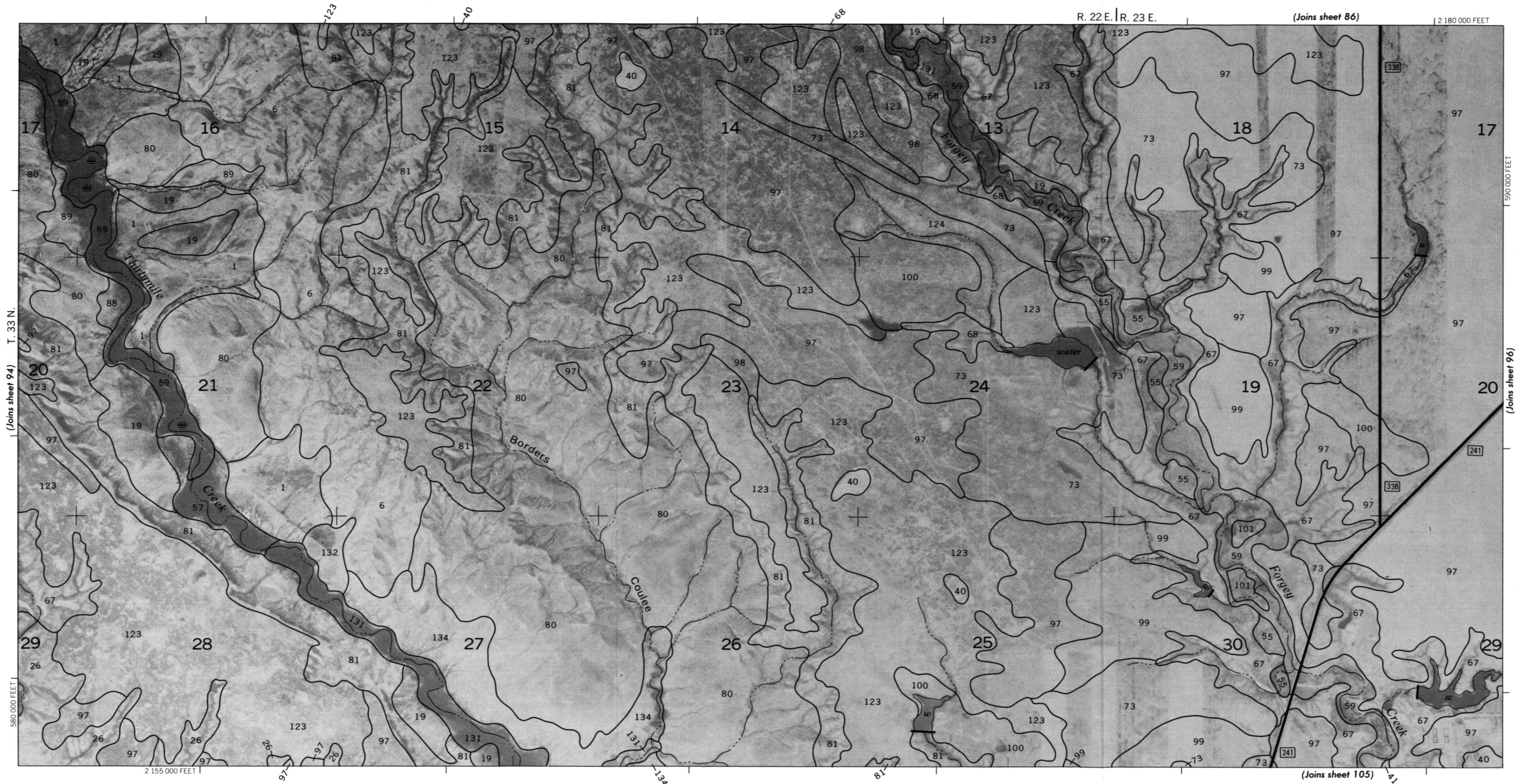
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

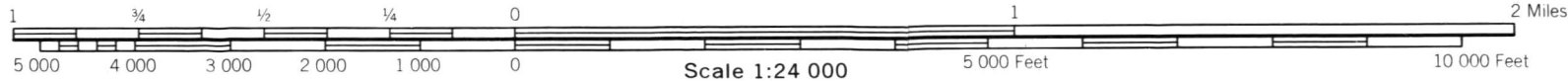
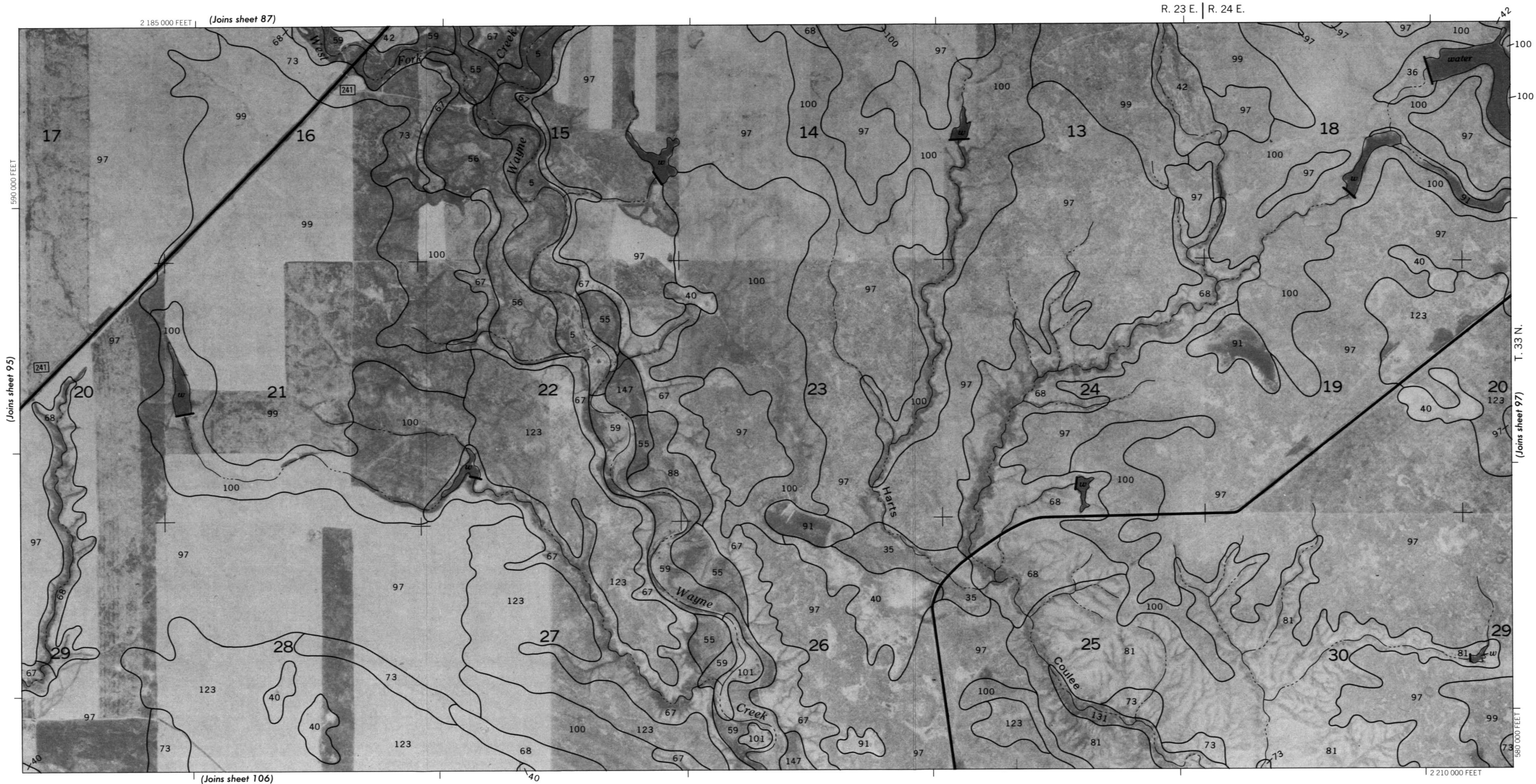




BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 95

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

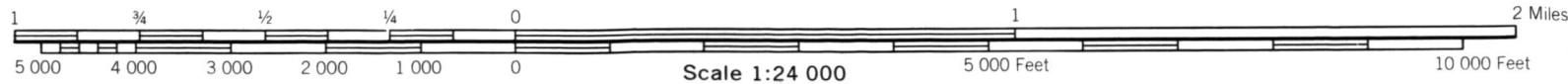
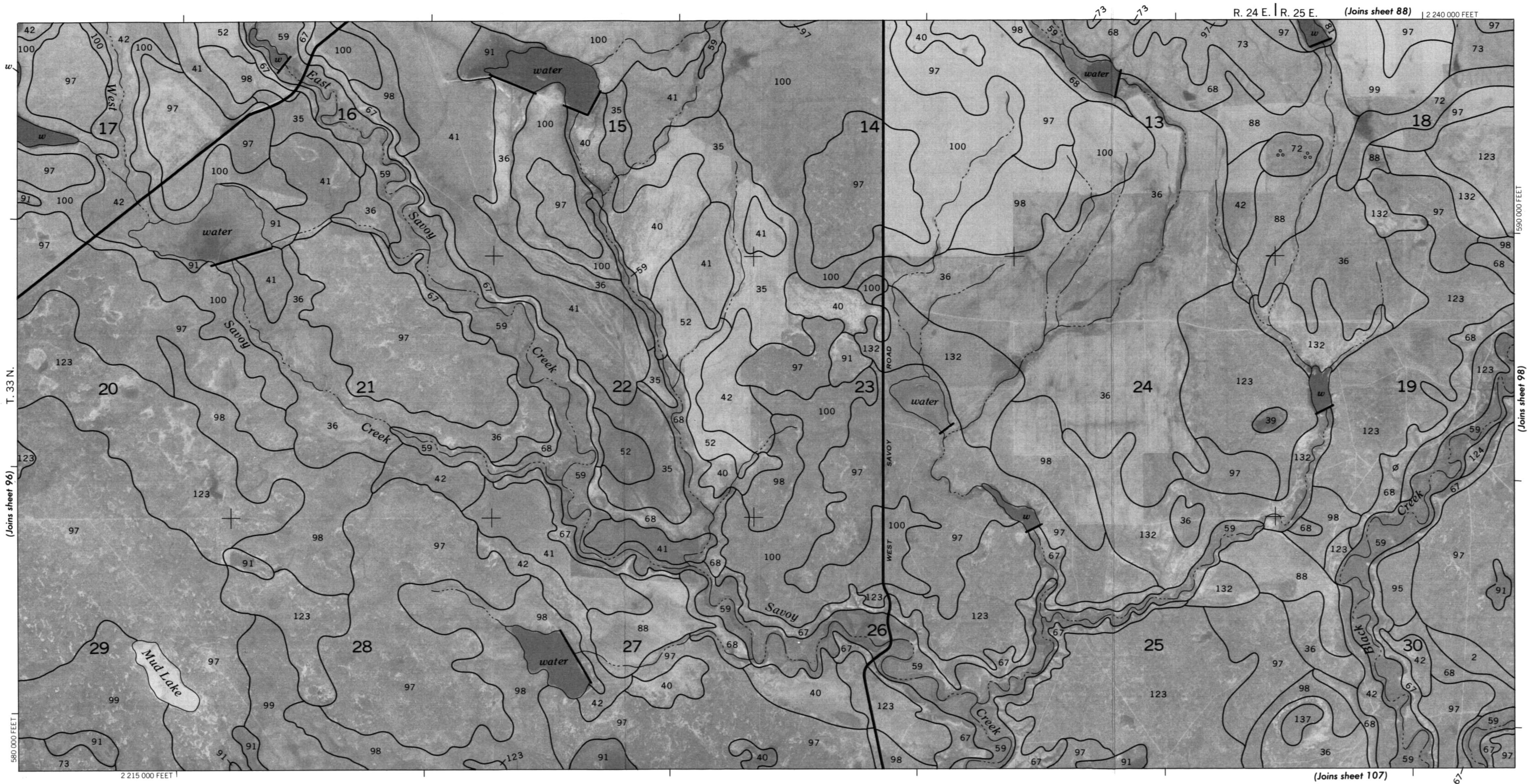


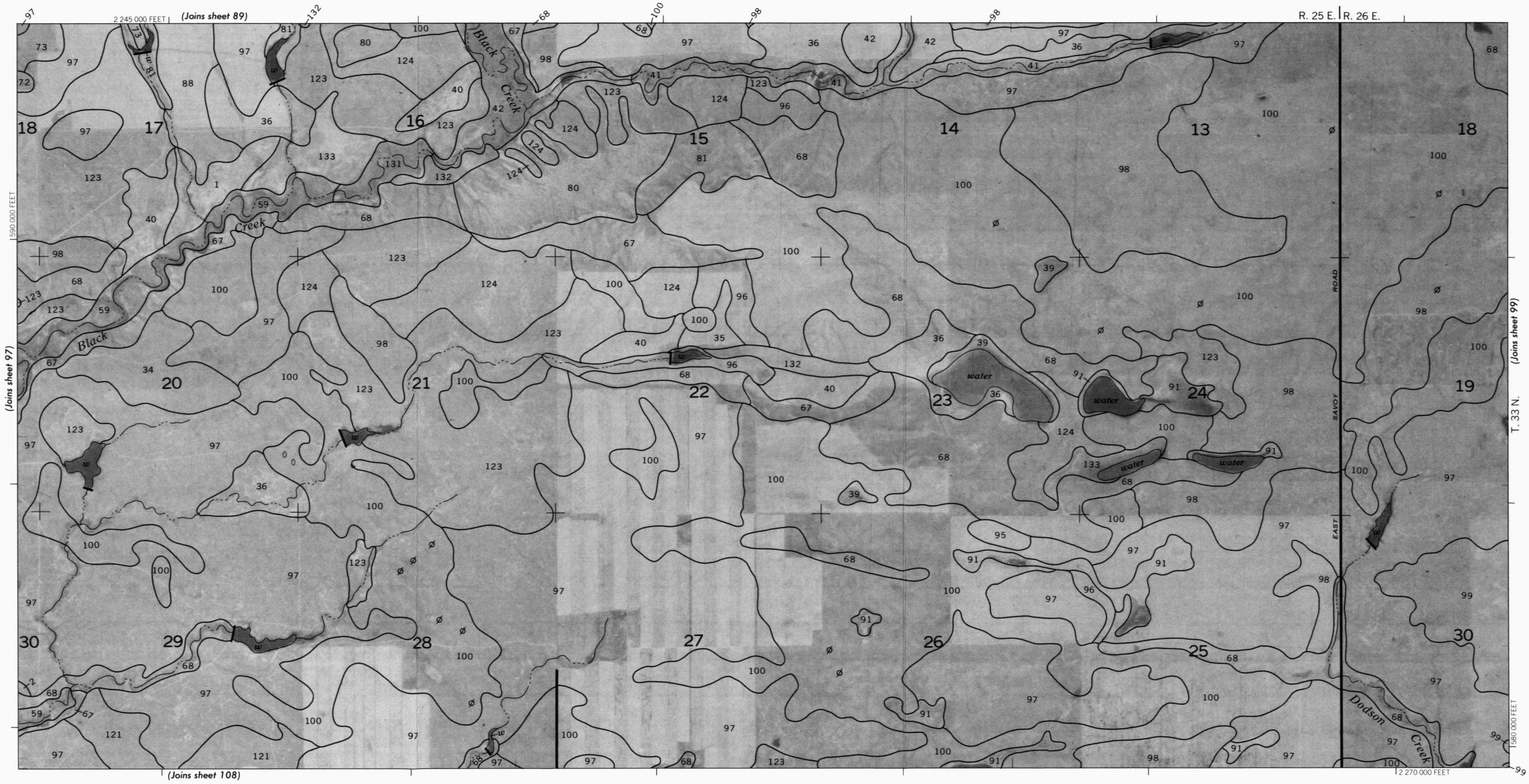


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

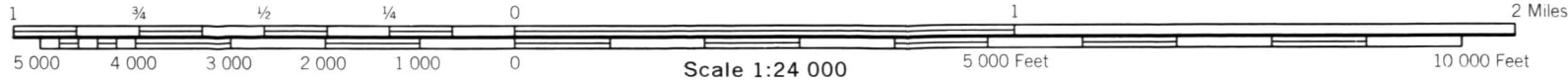
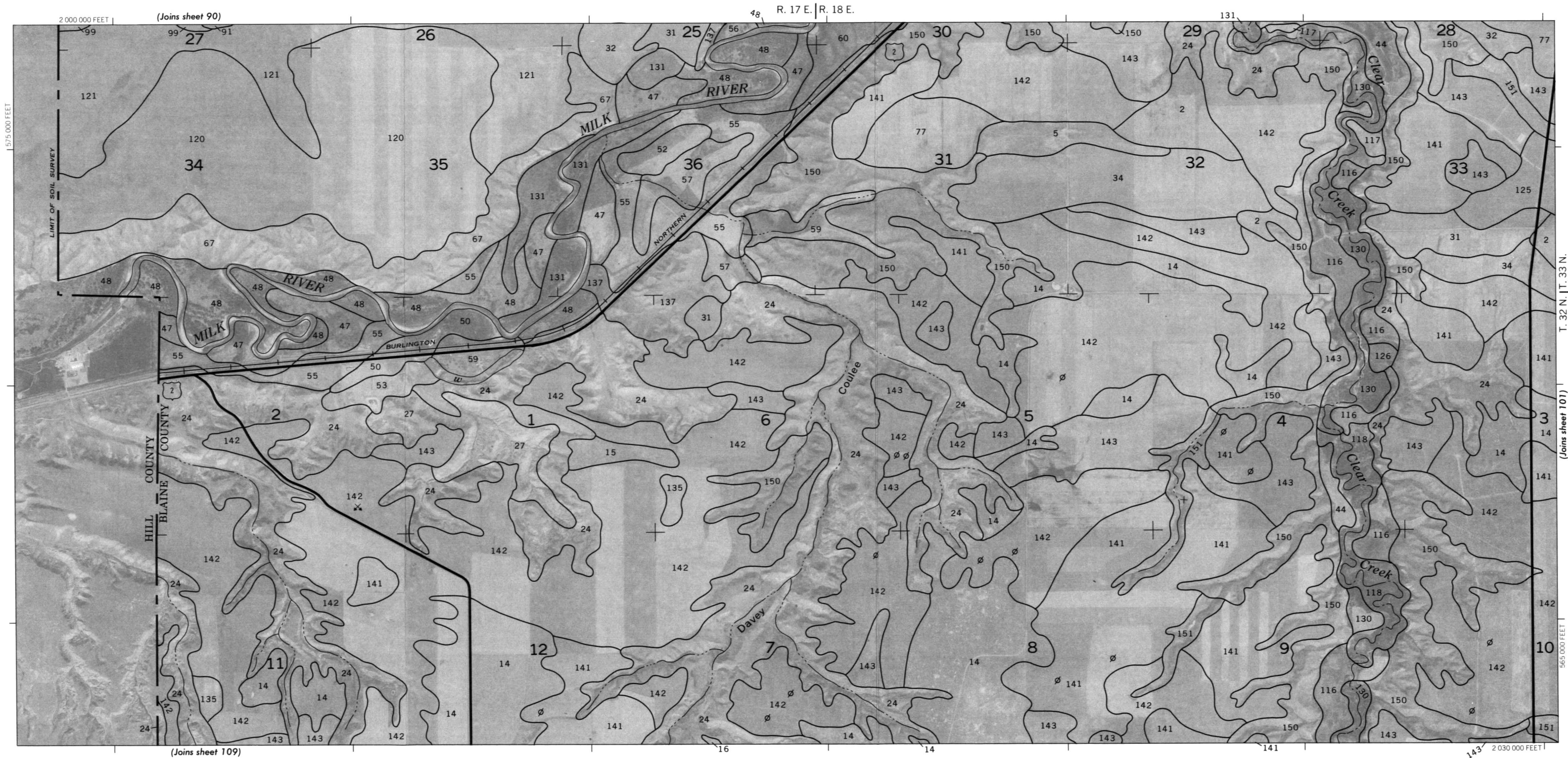
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 97

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





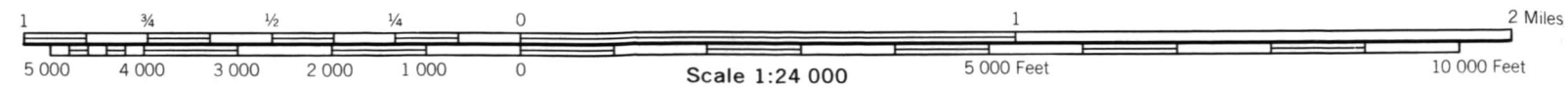
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

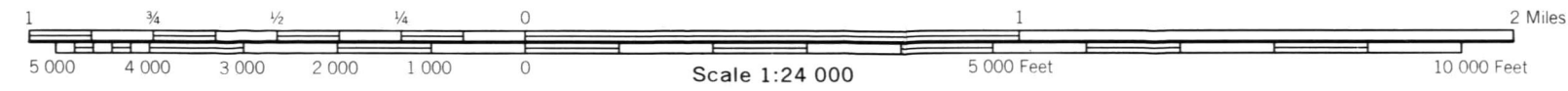
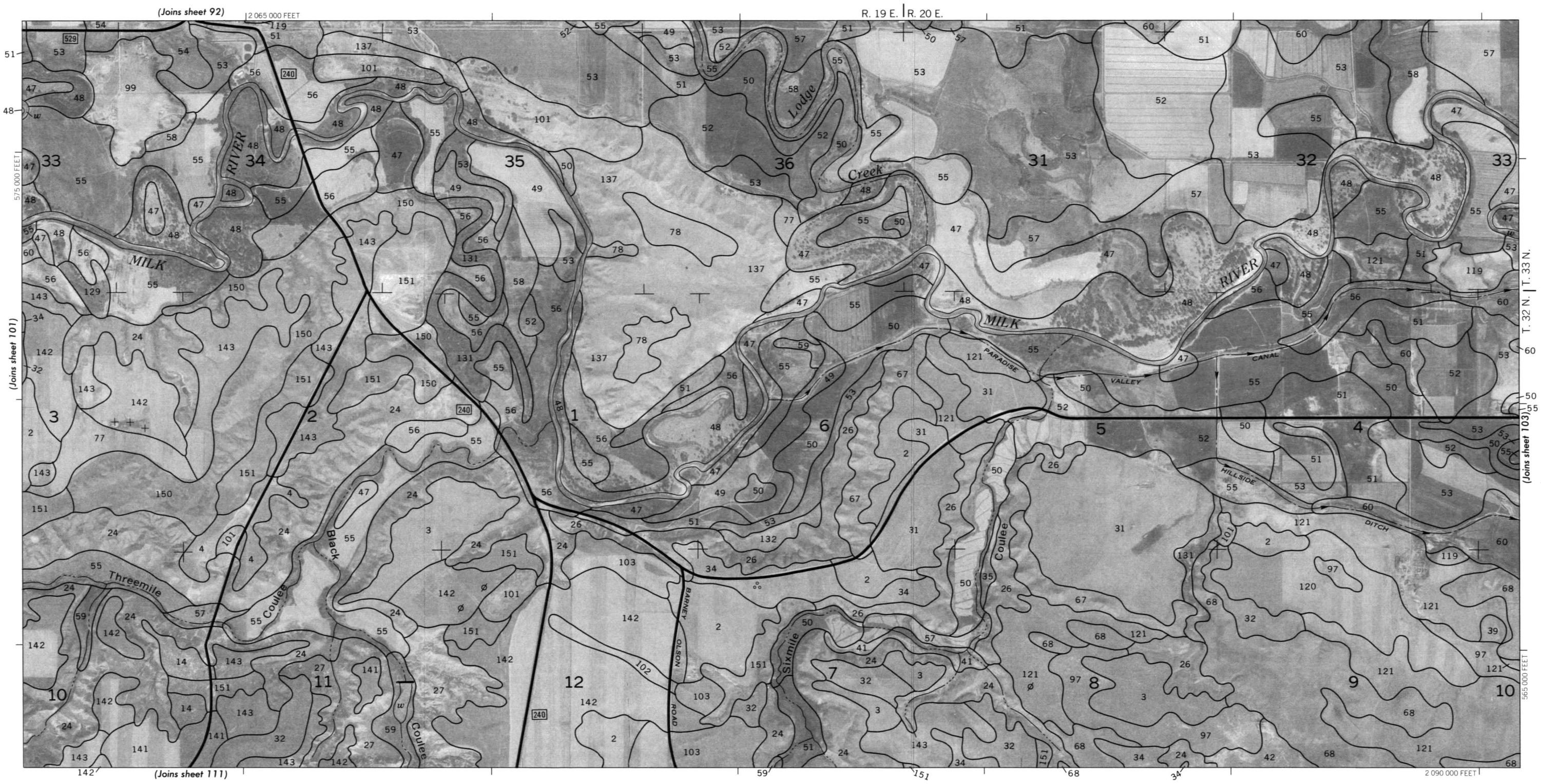


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 101

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



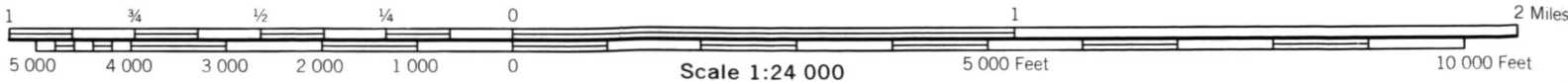
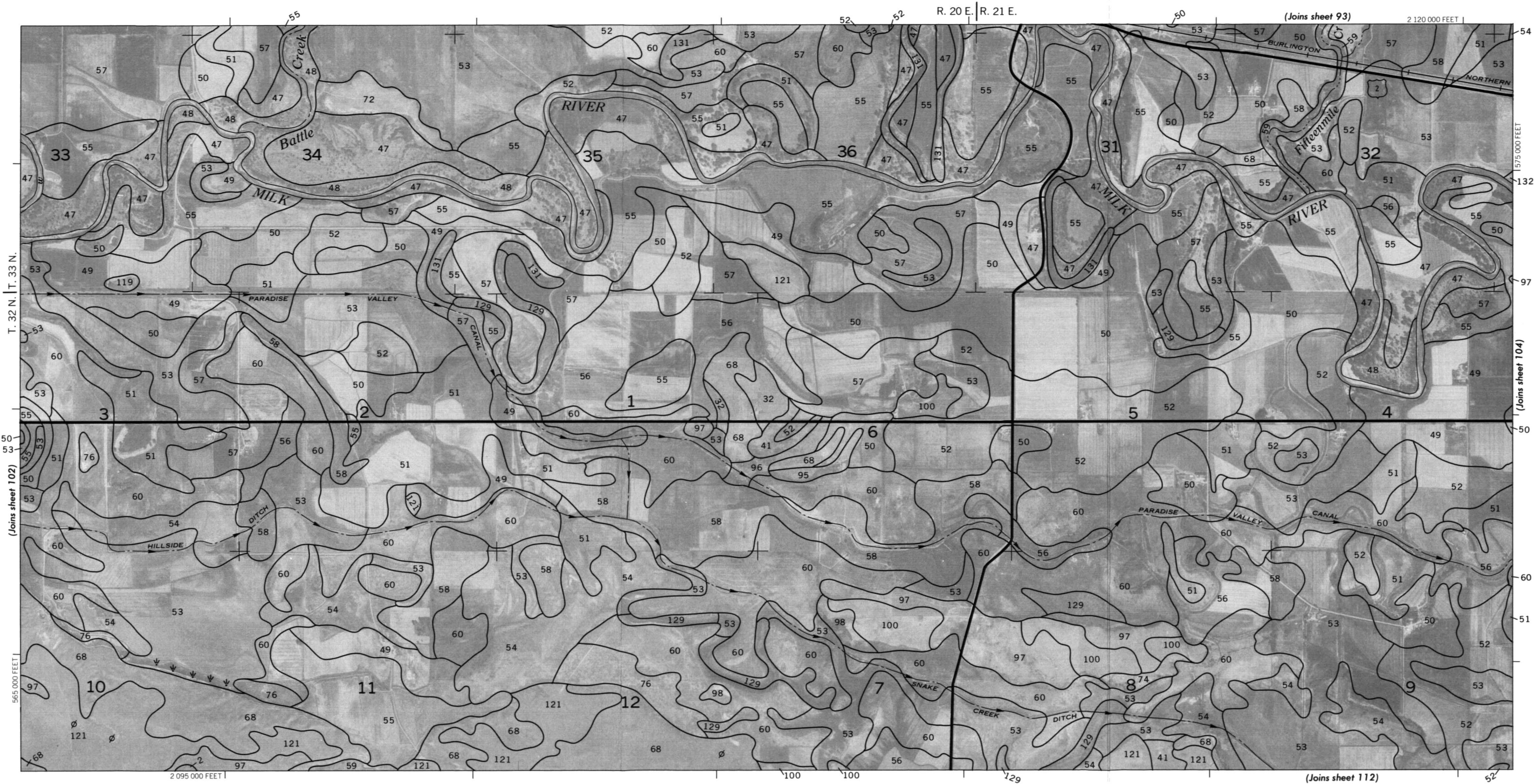


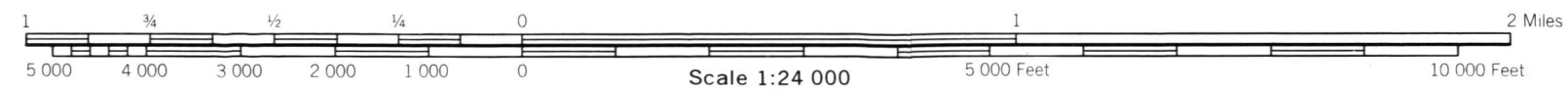
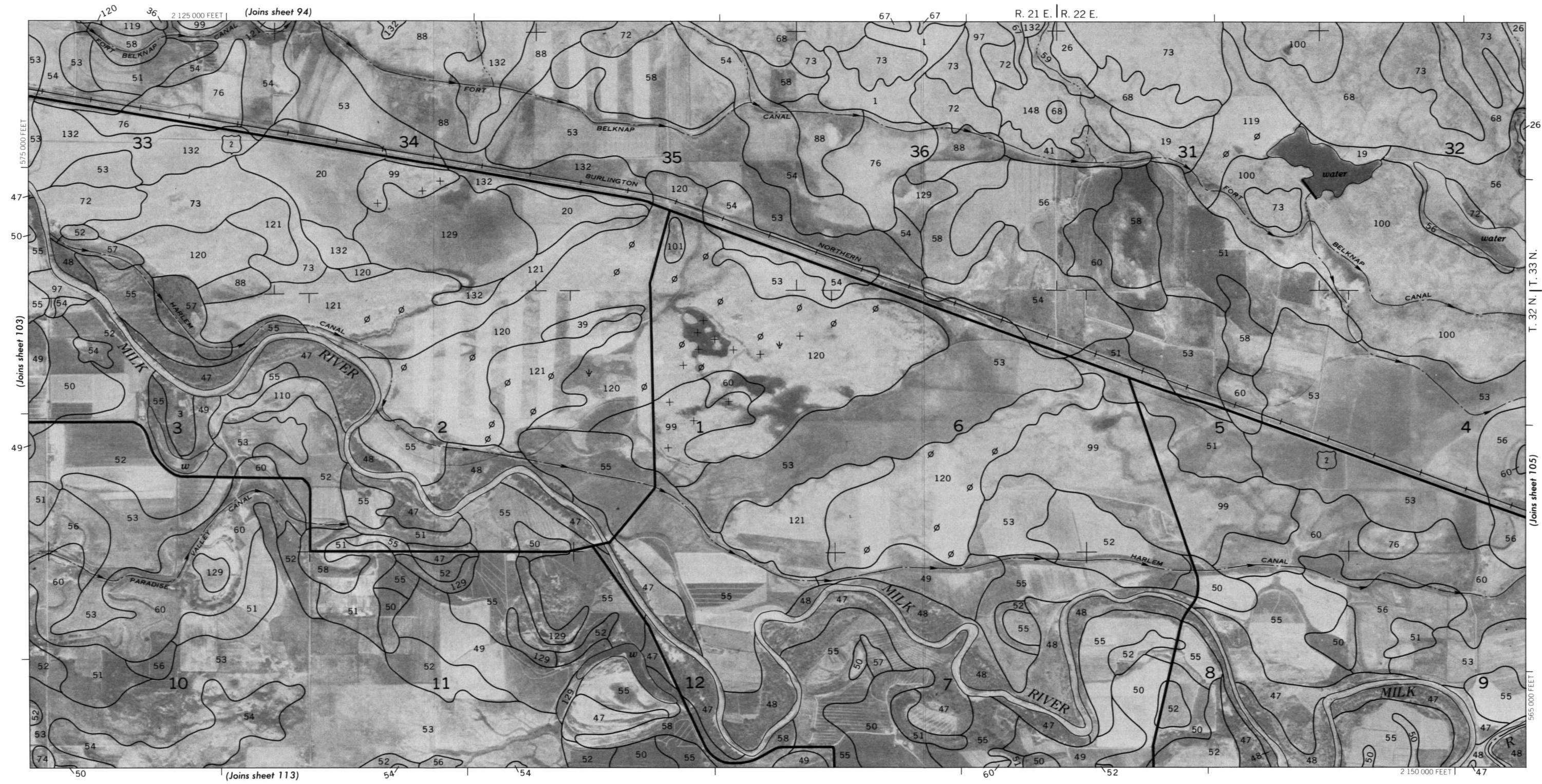
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 103

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

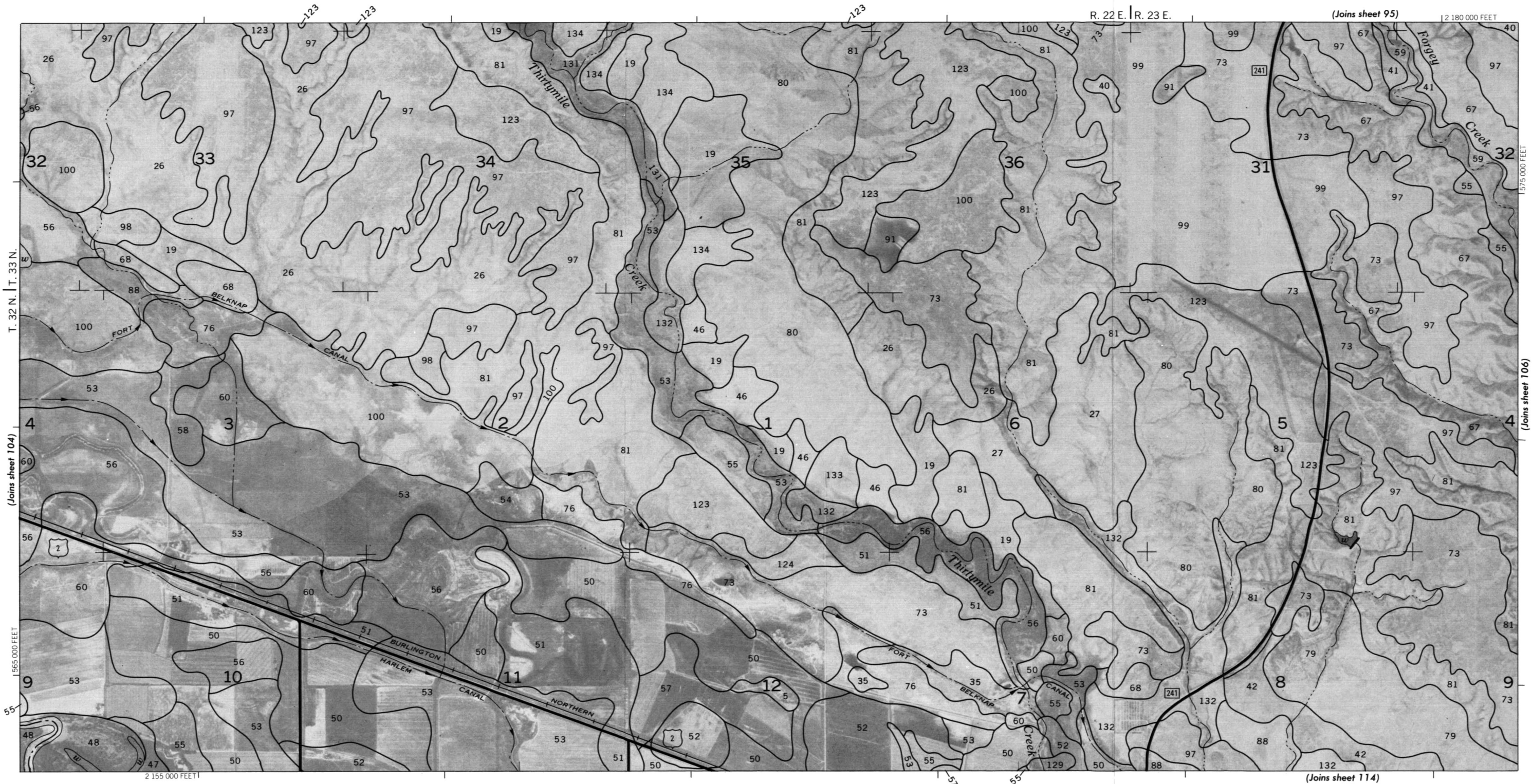




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 105

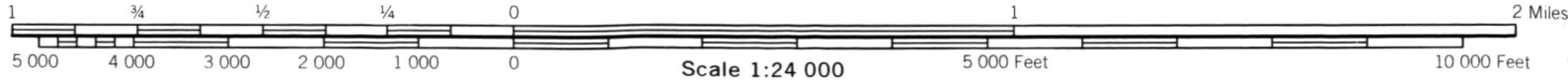
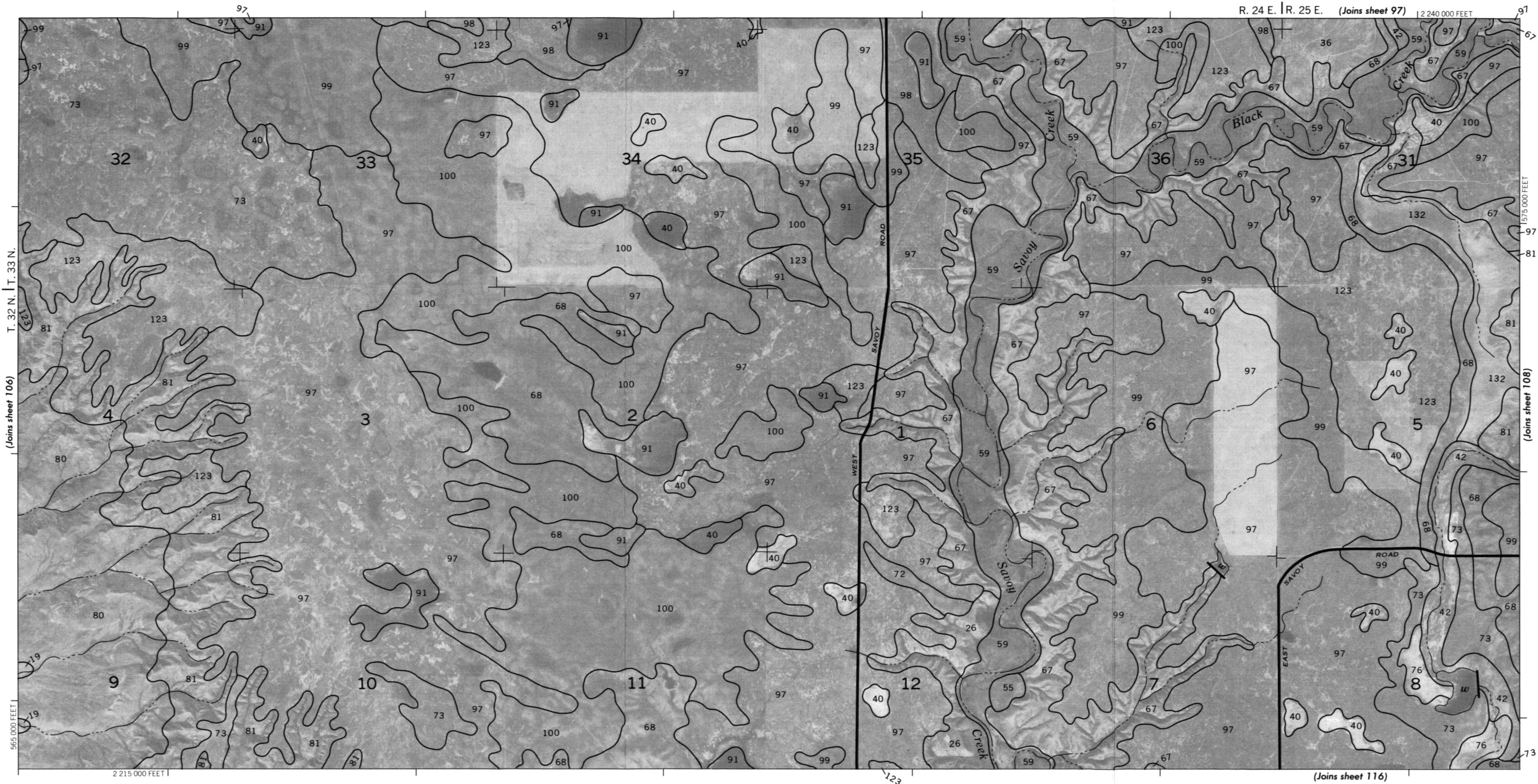




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

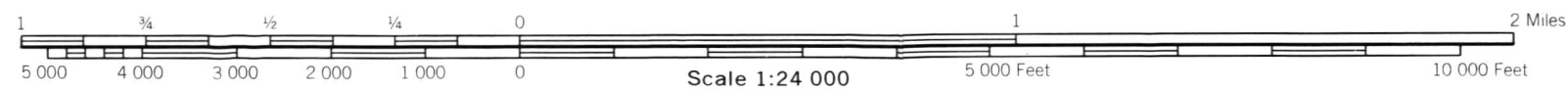
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 107

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





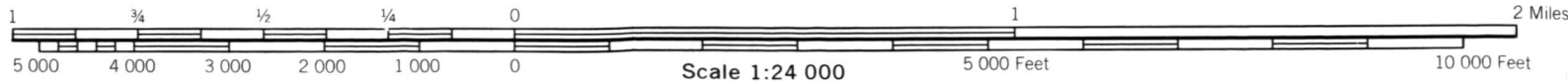
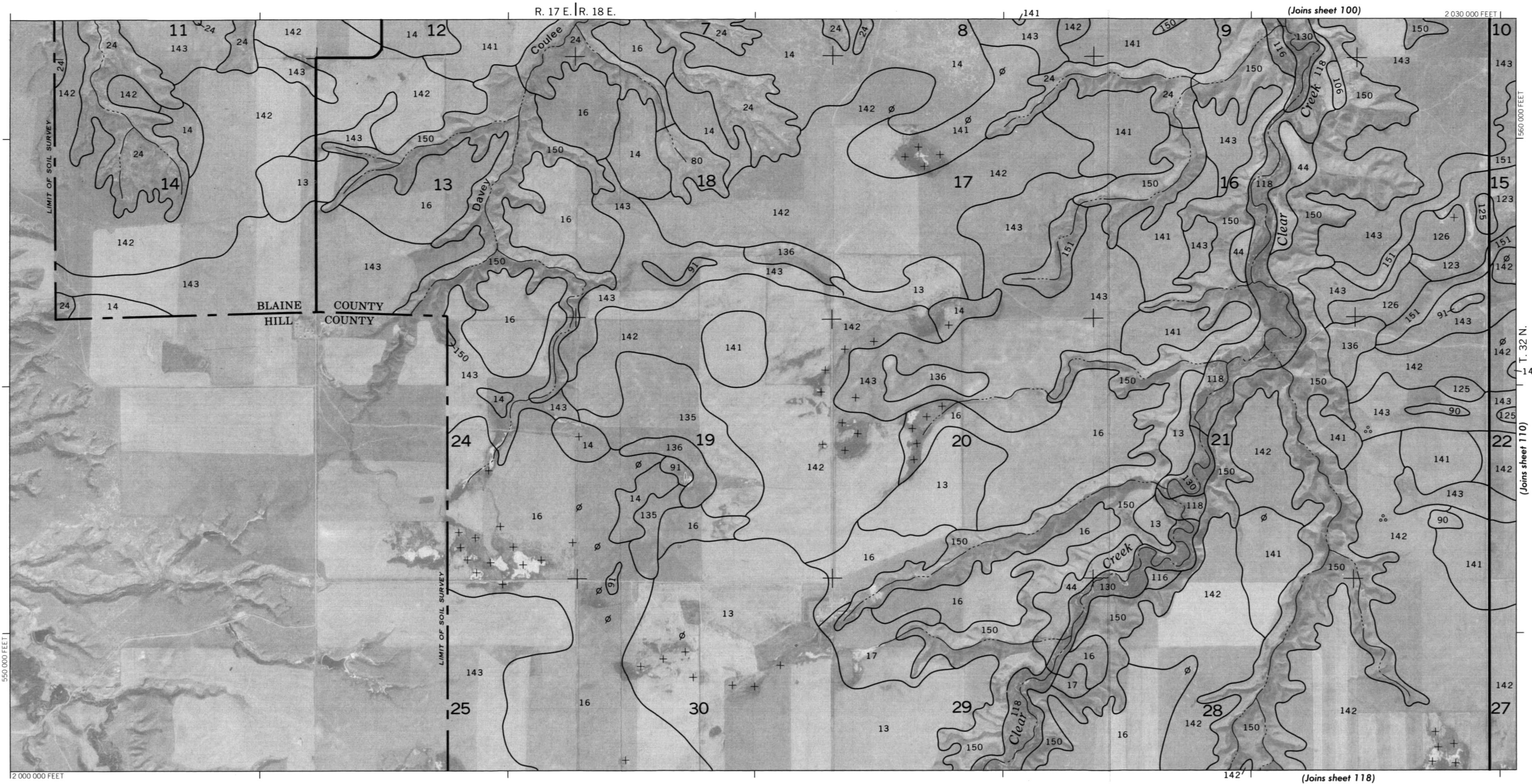
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.





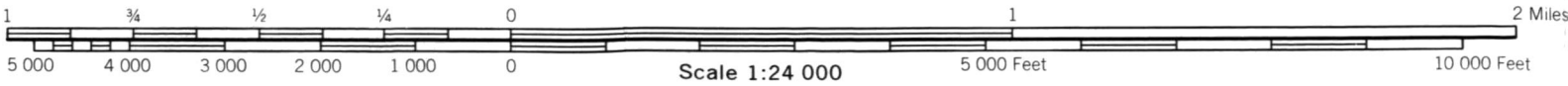
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 109

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



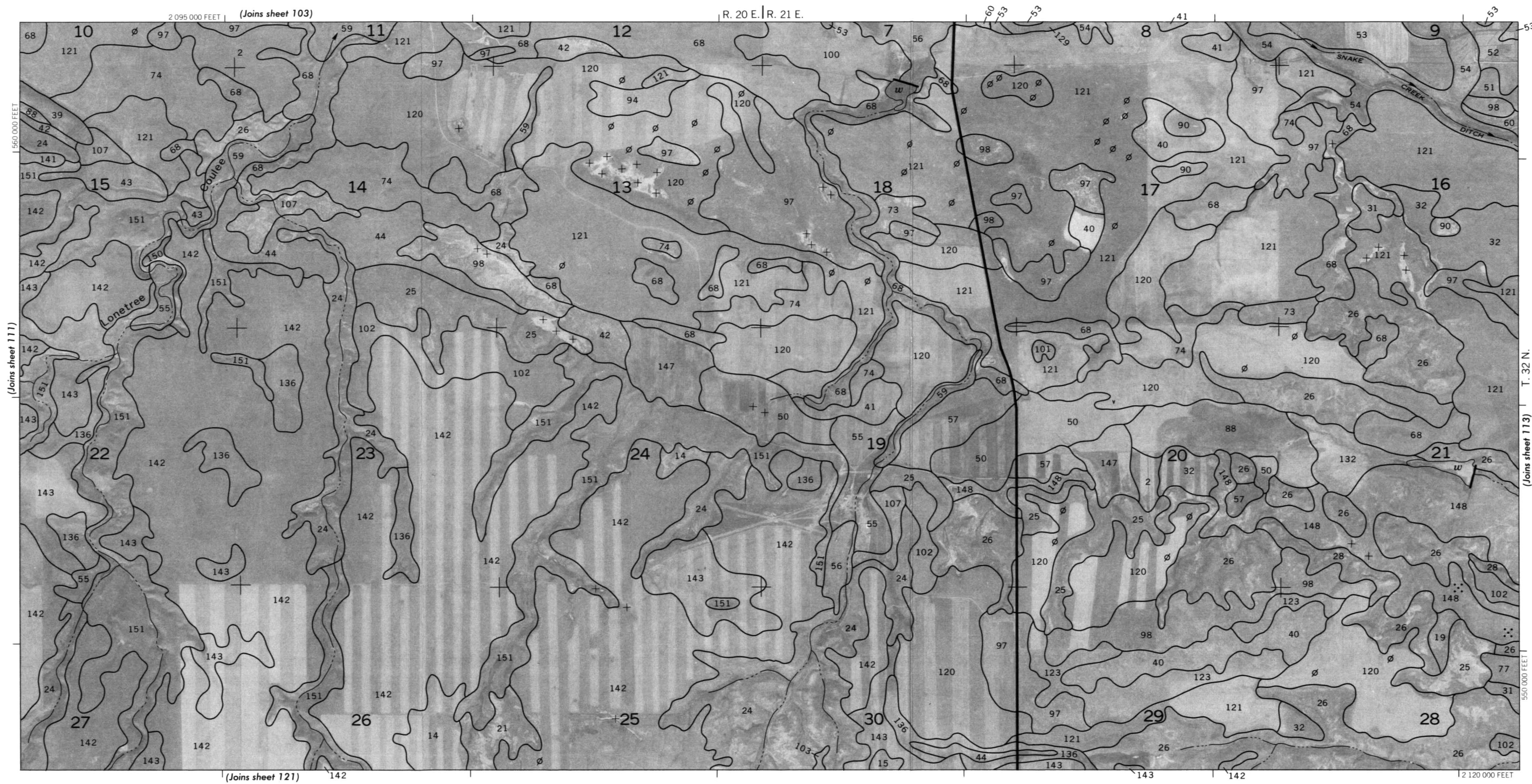


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

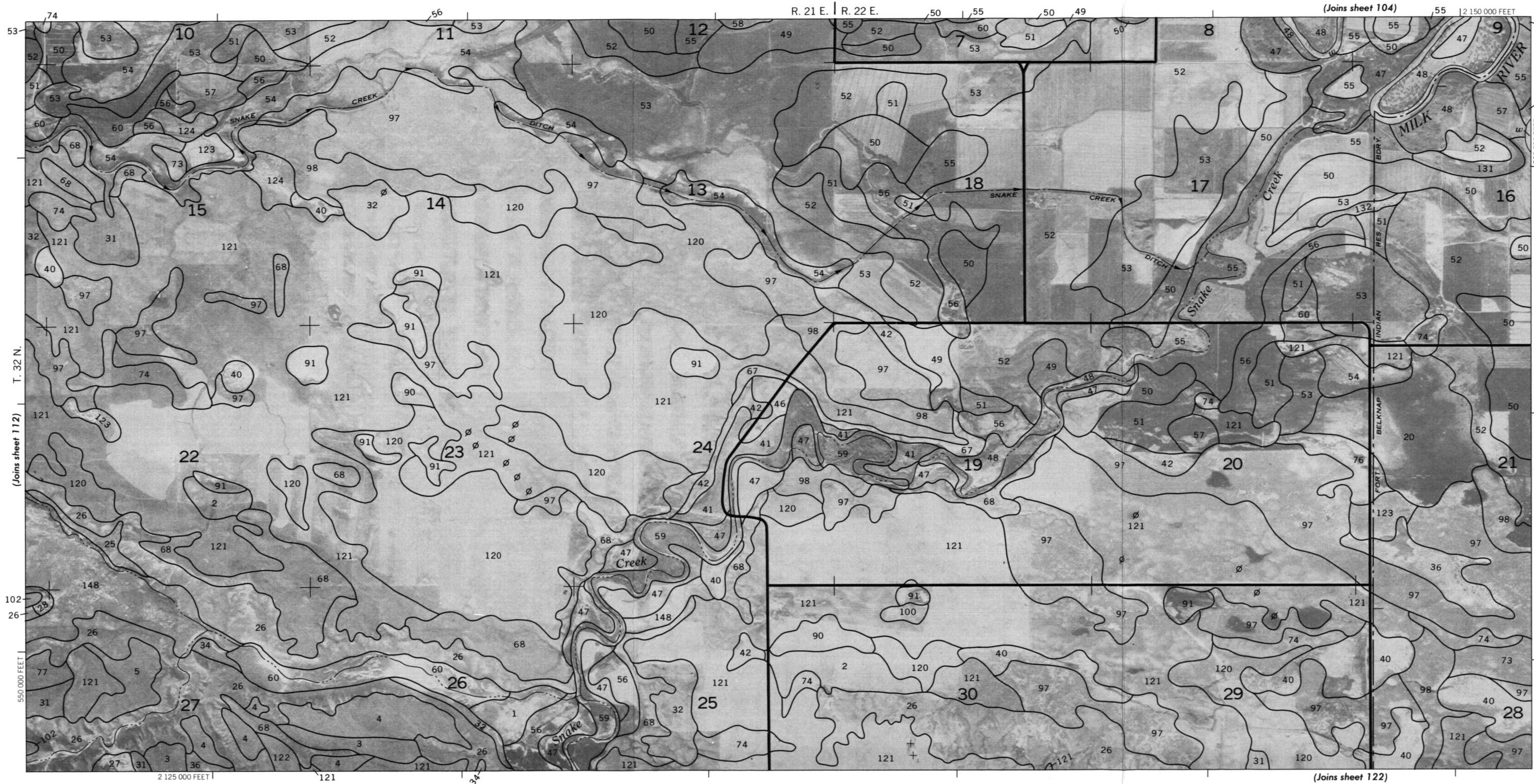


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 111

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

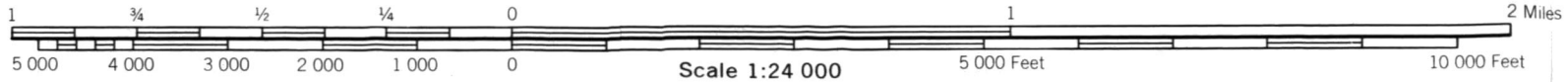


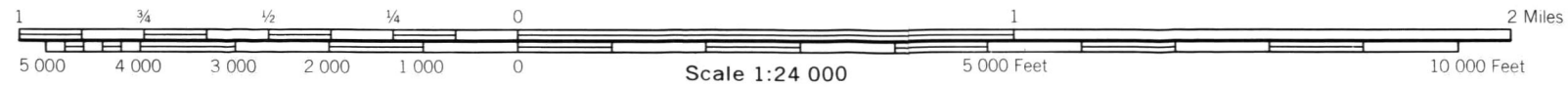
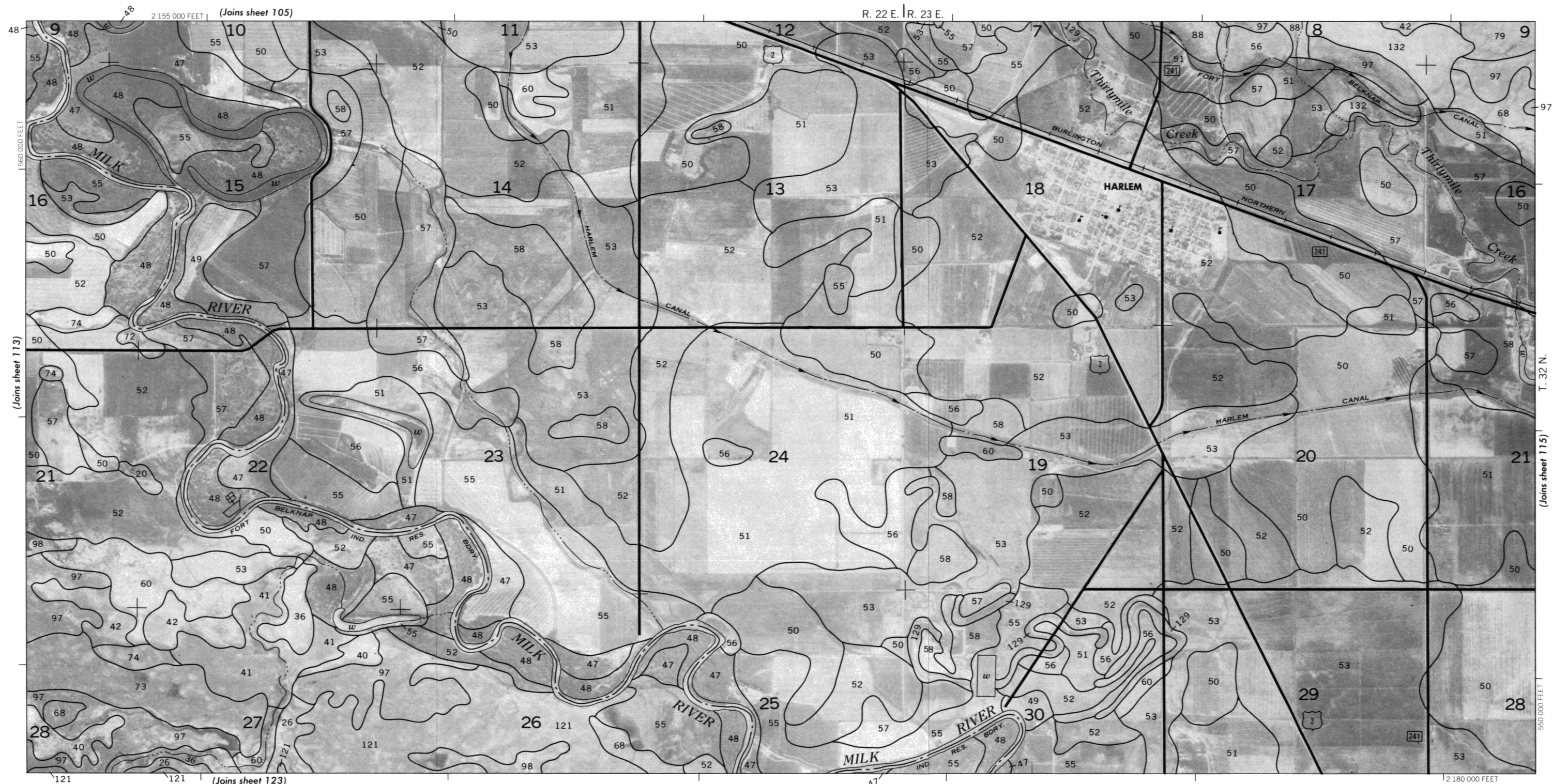
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 113

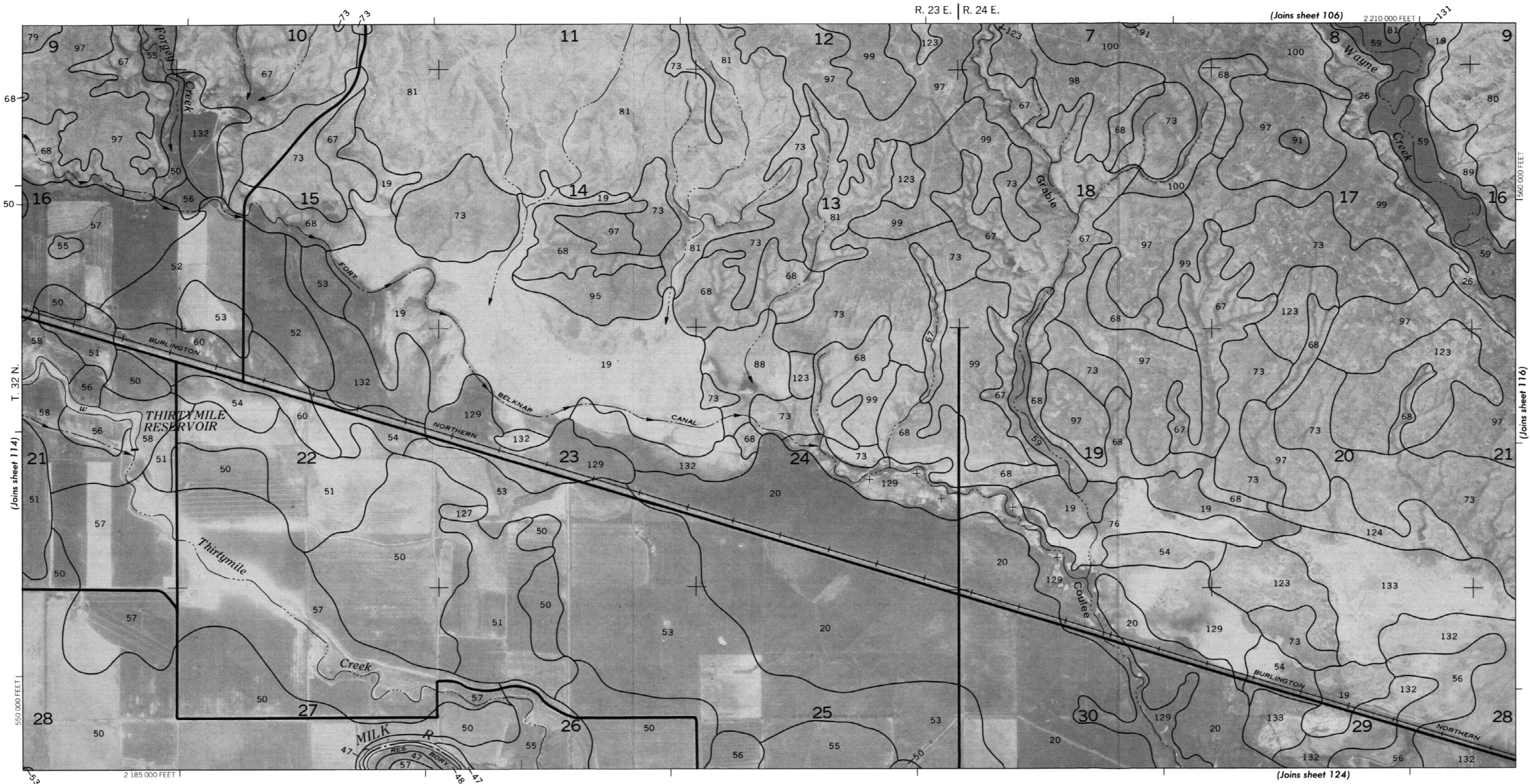
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

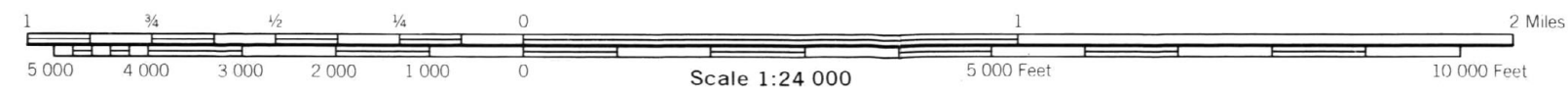
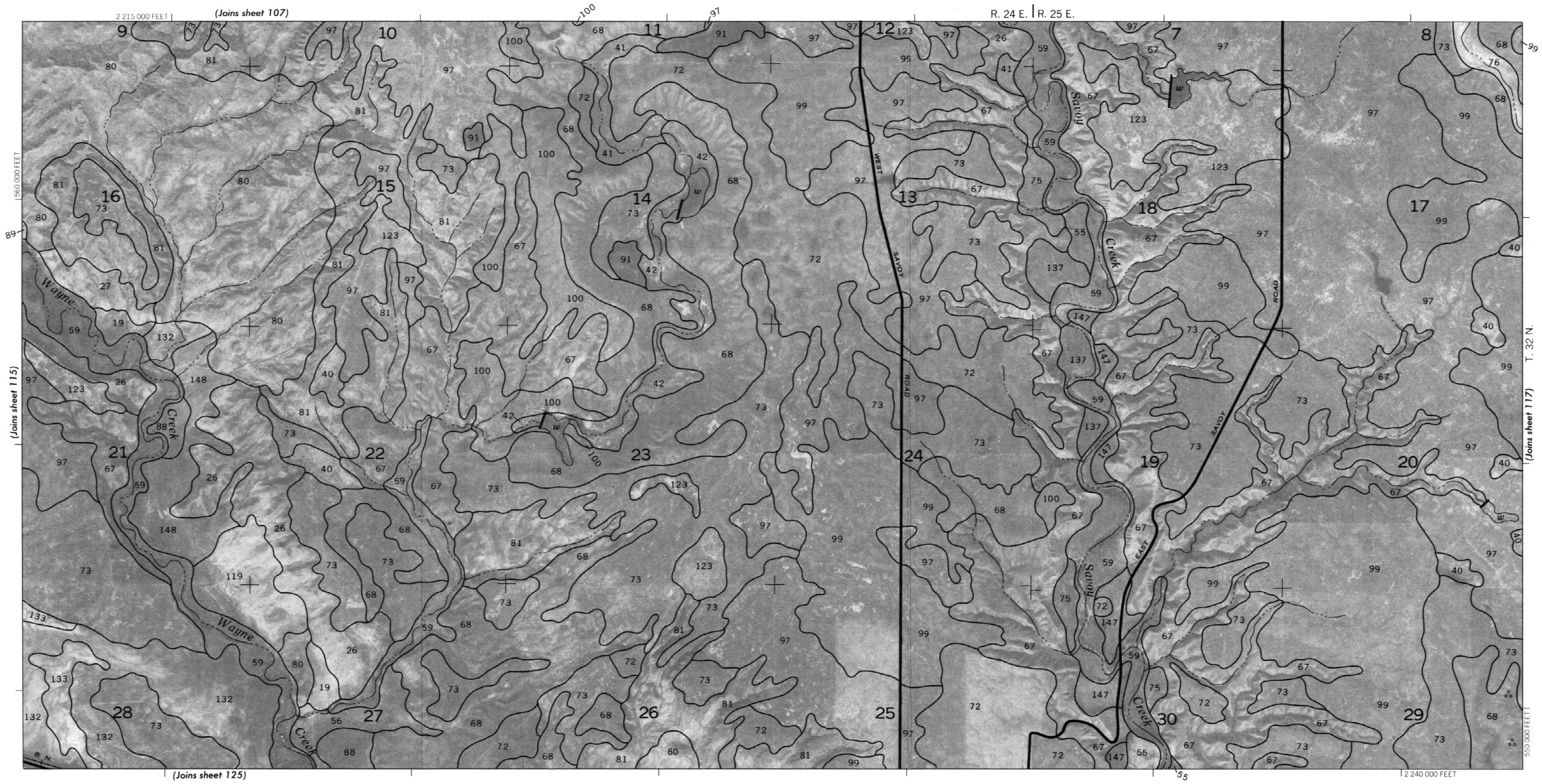




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

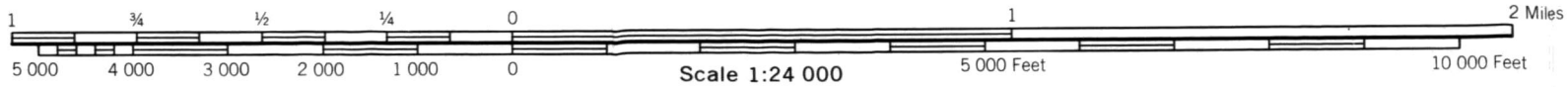
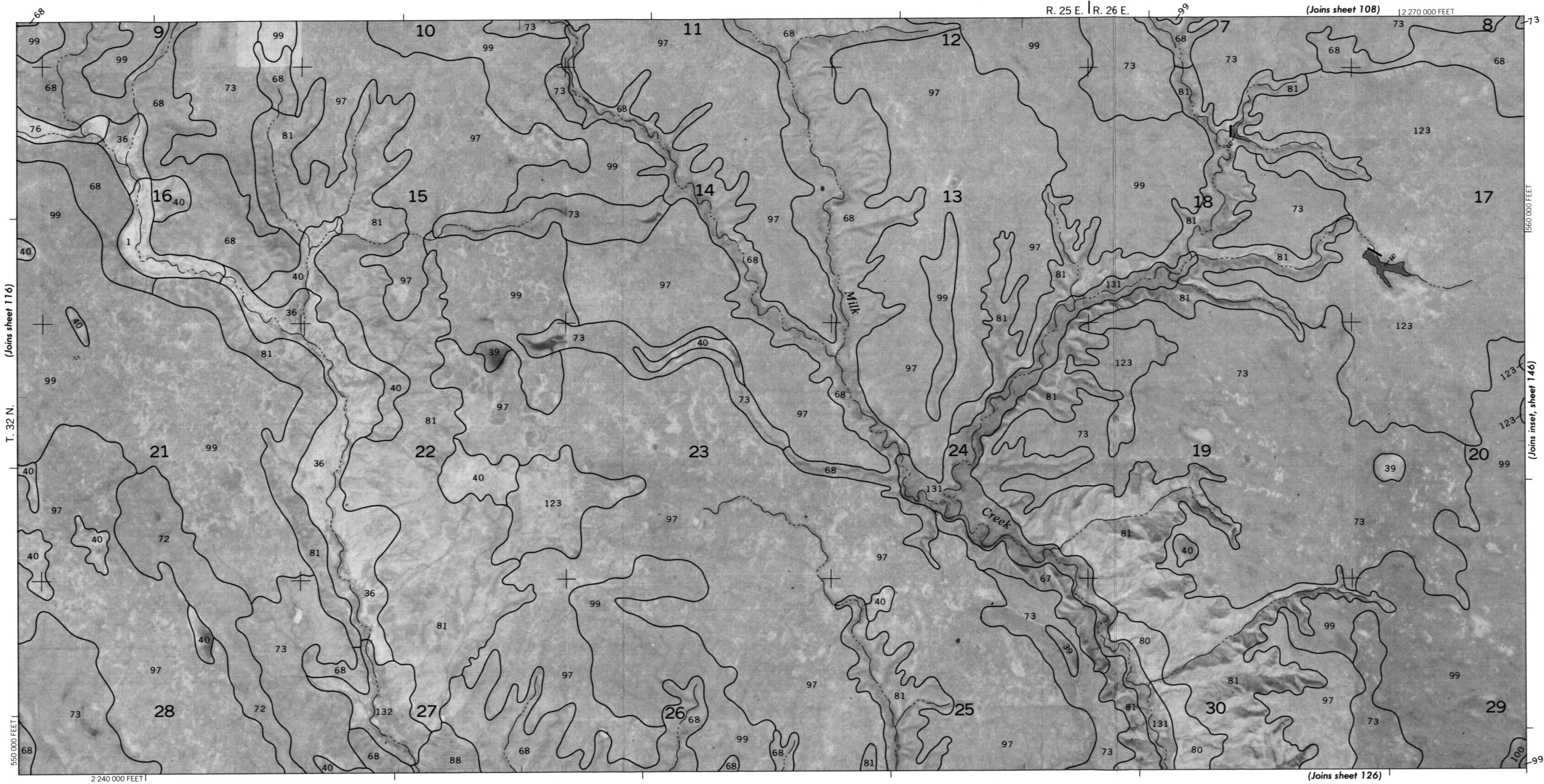




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

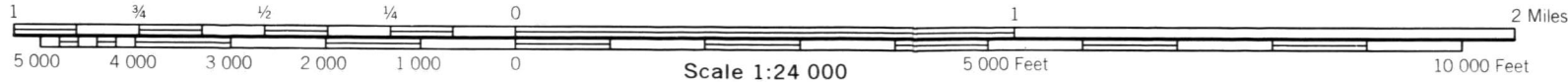
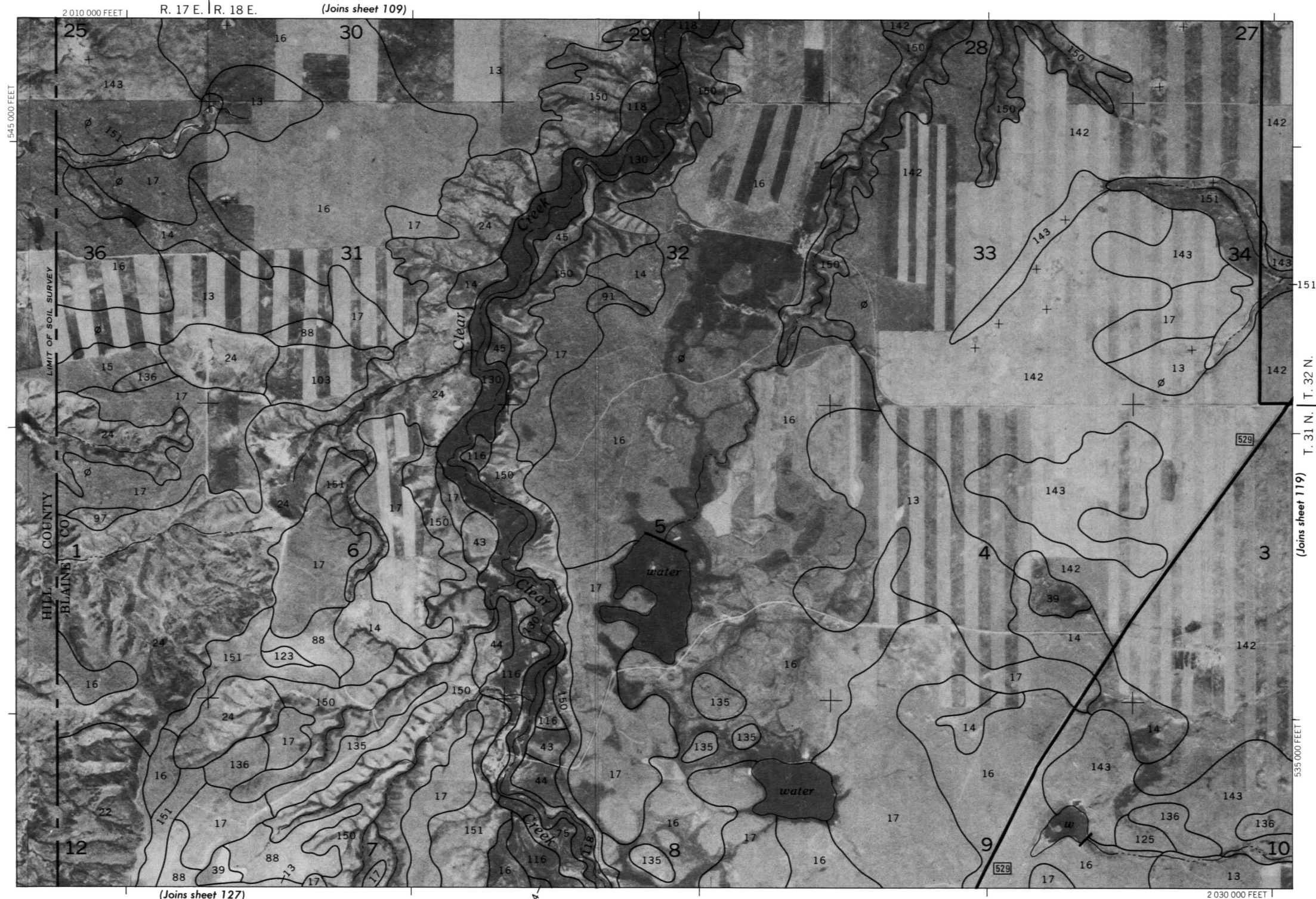
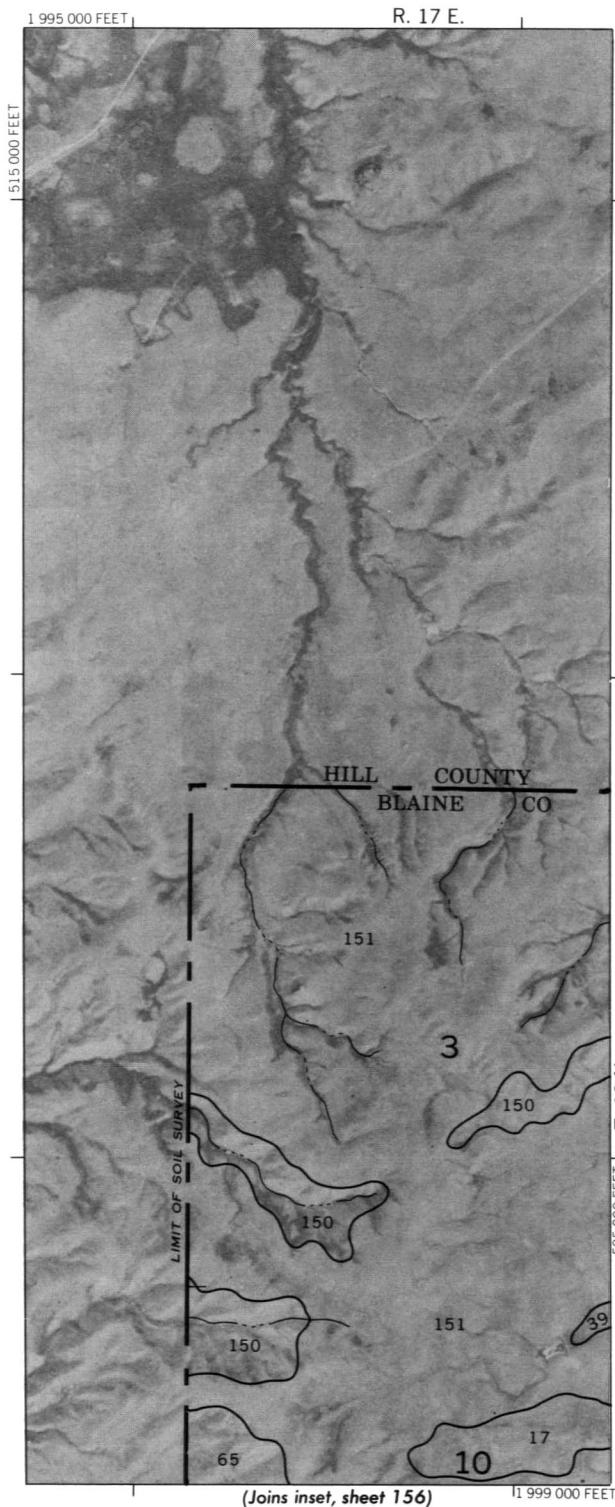
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 117





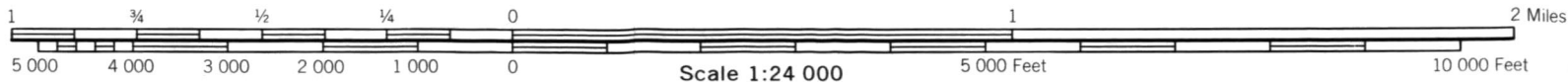
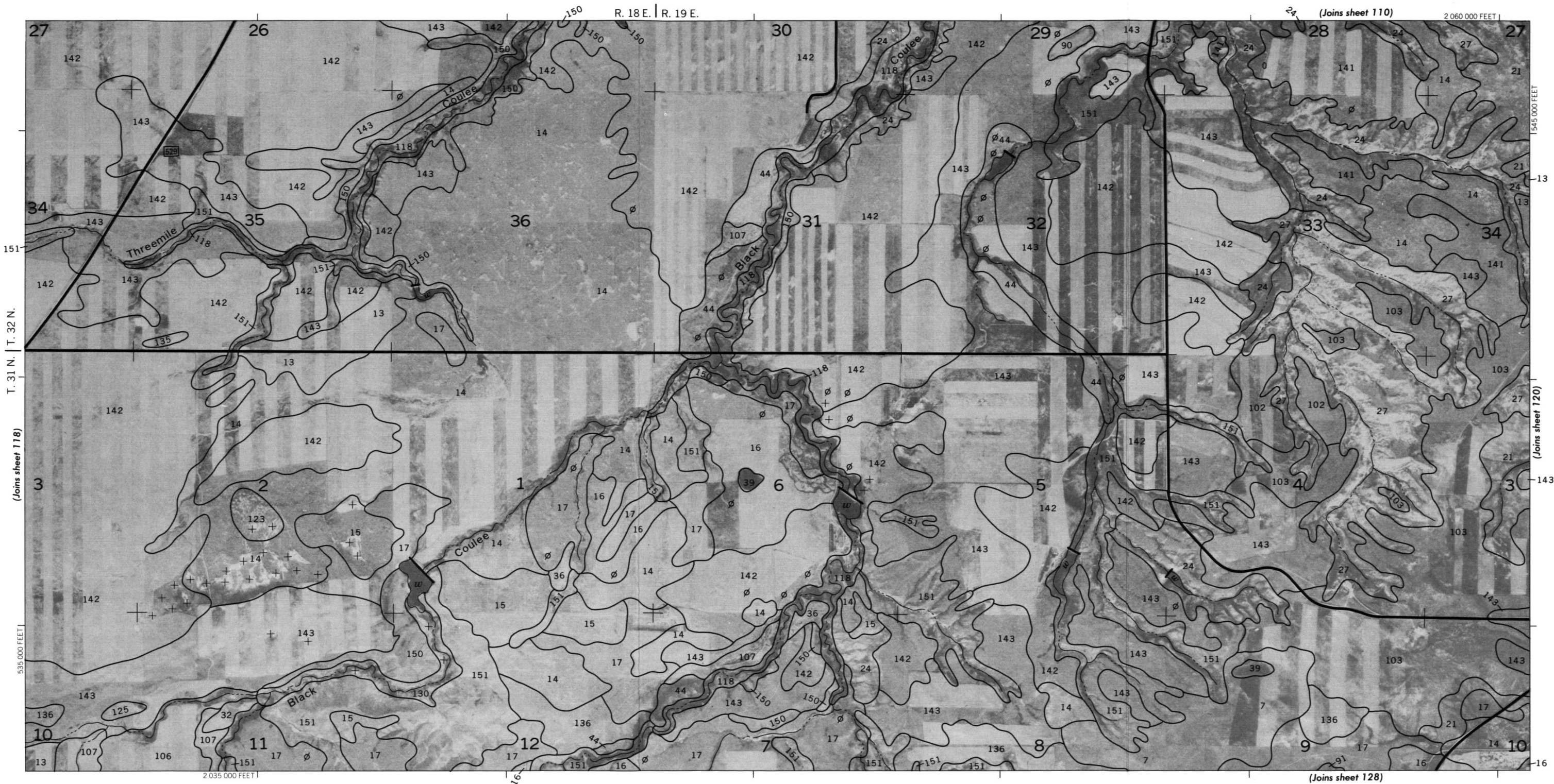
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 118

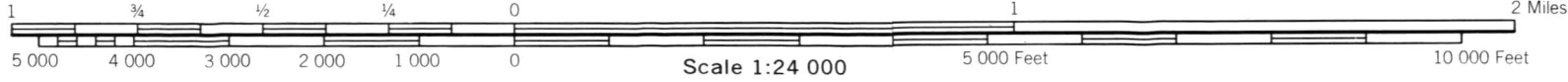
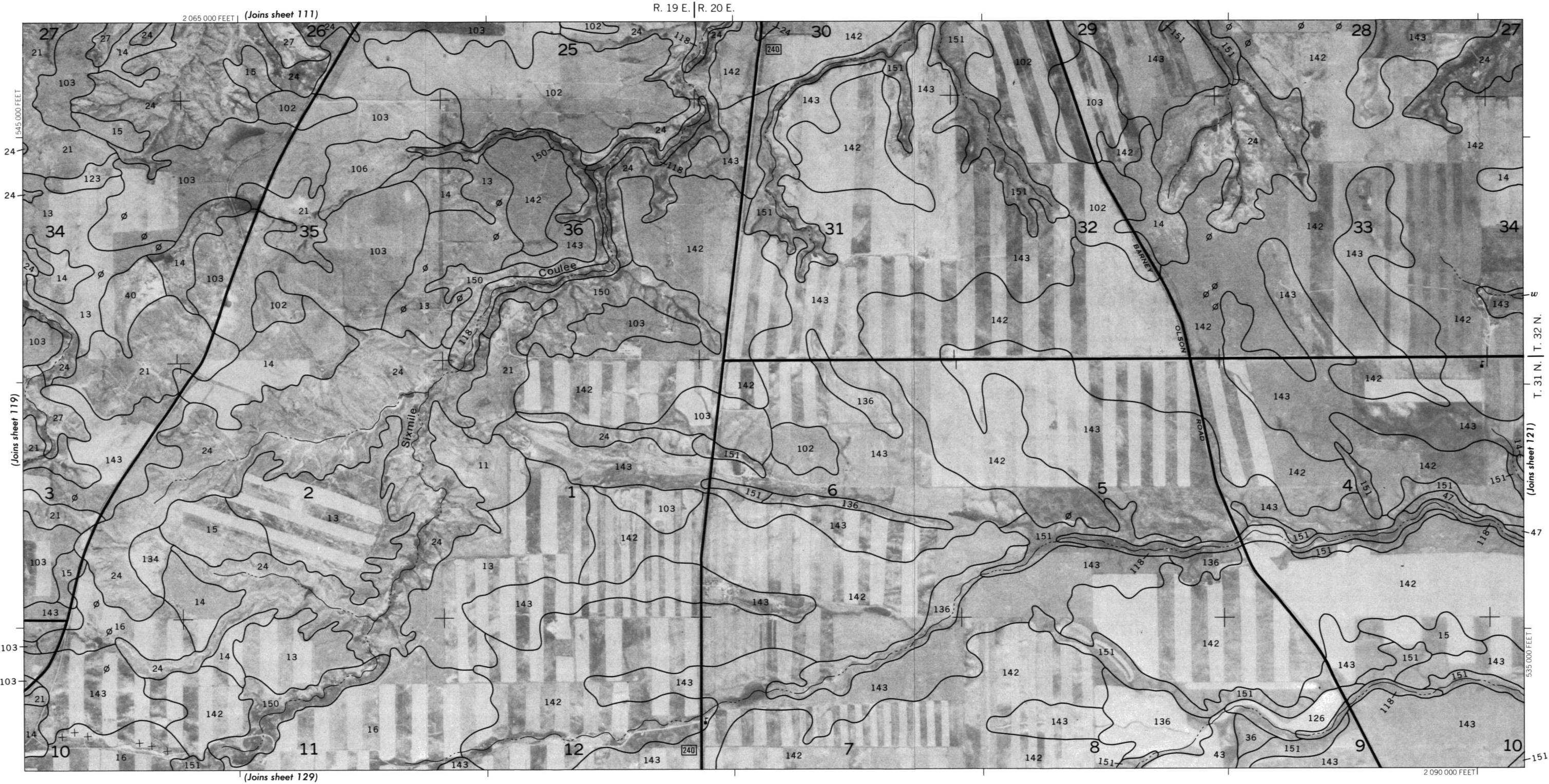


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 119

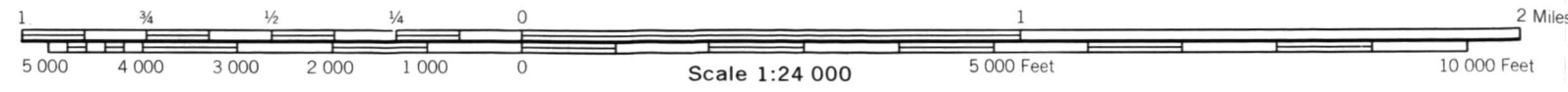
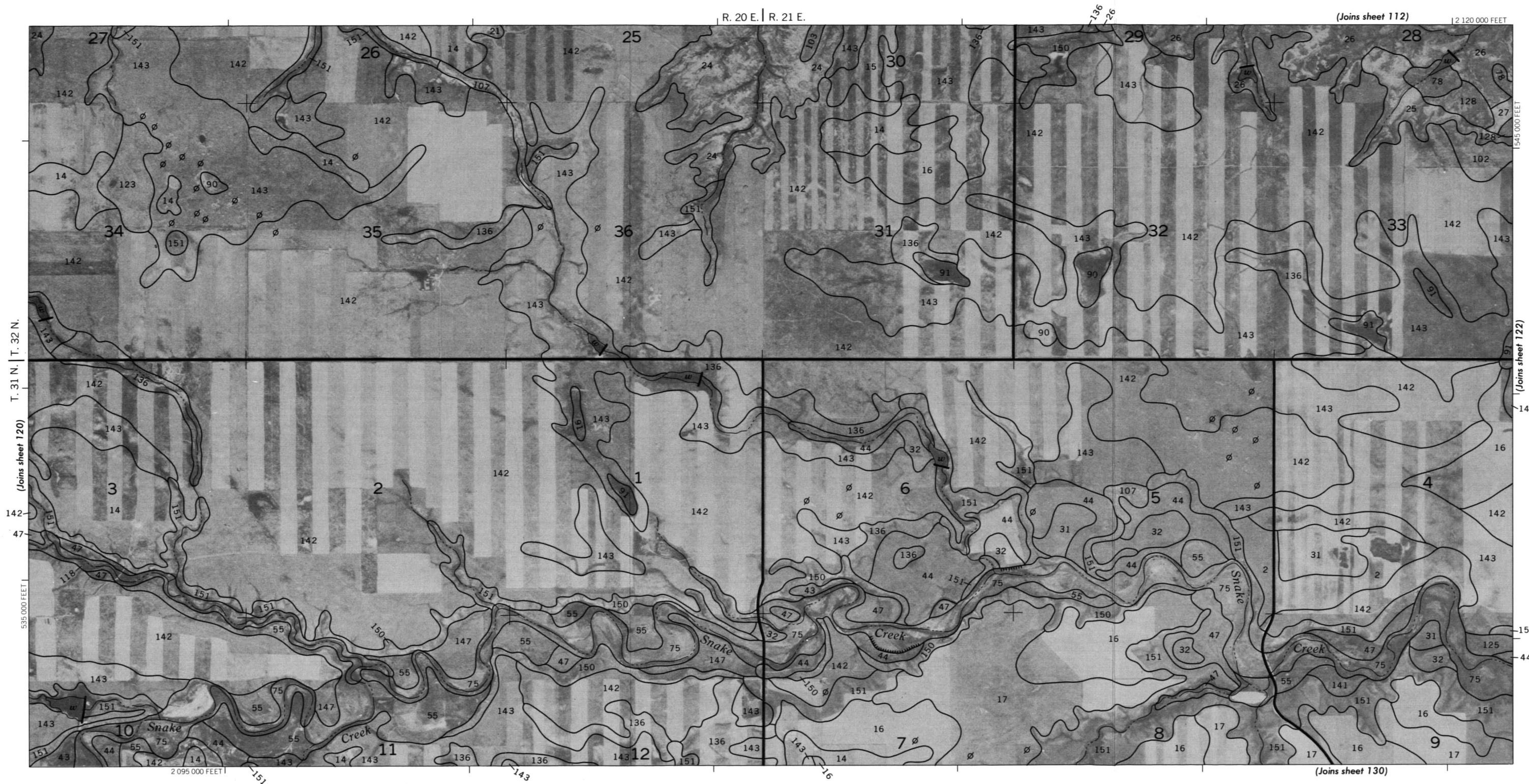
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

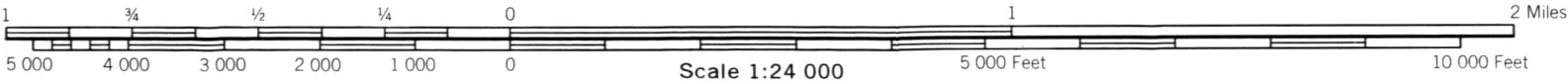
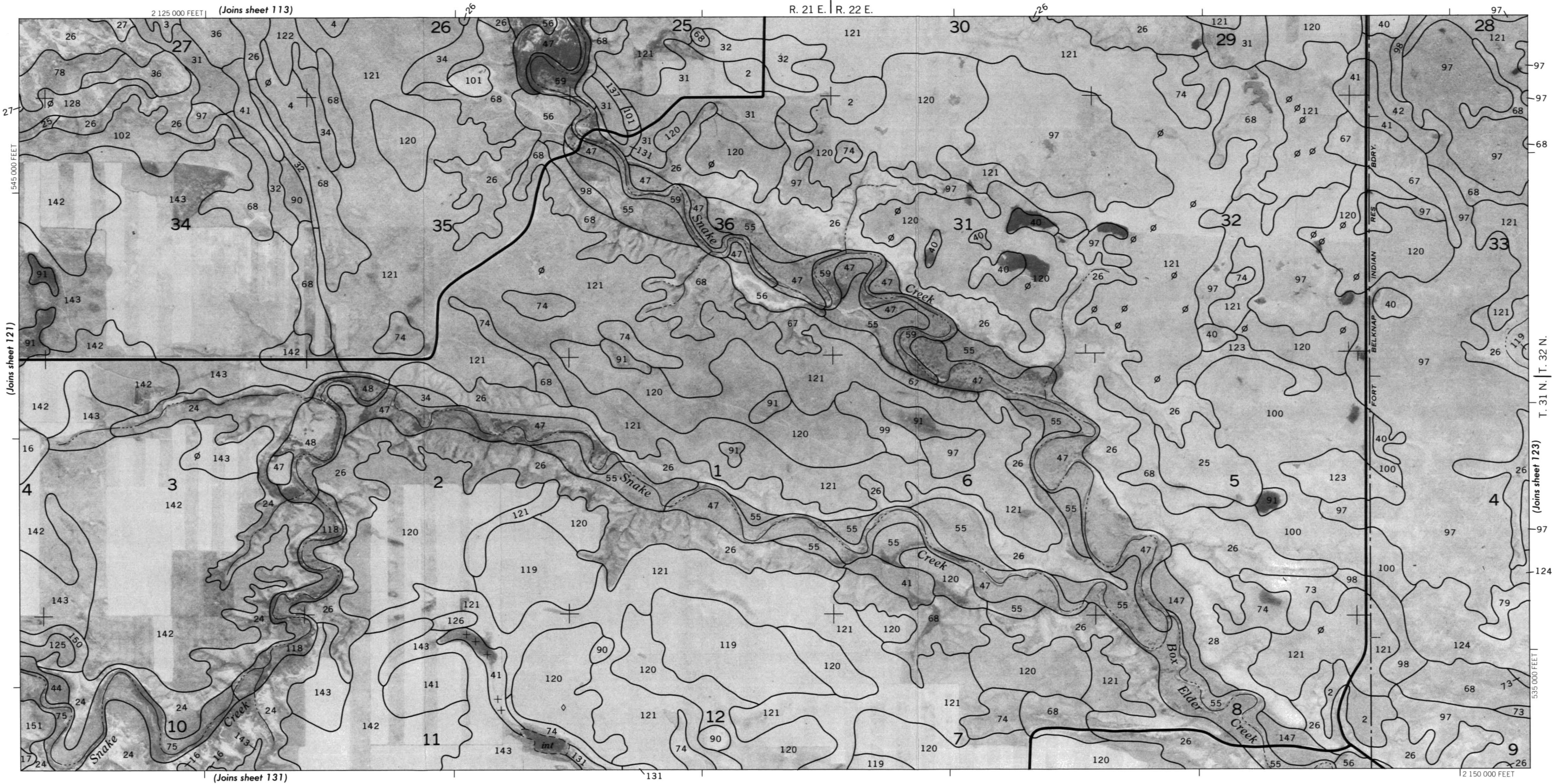




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

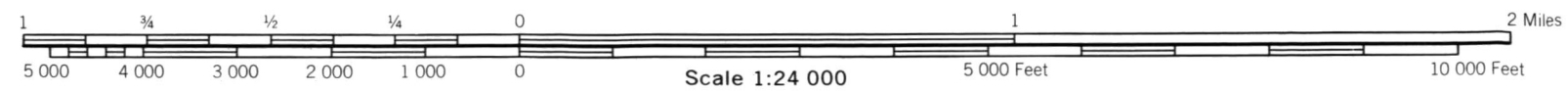
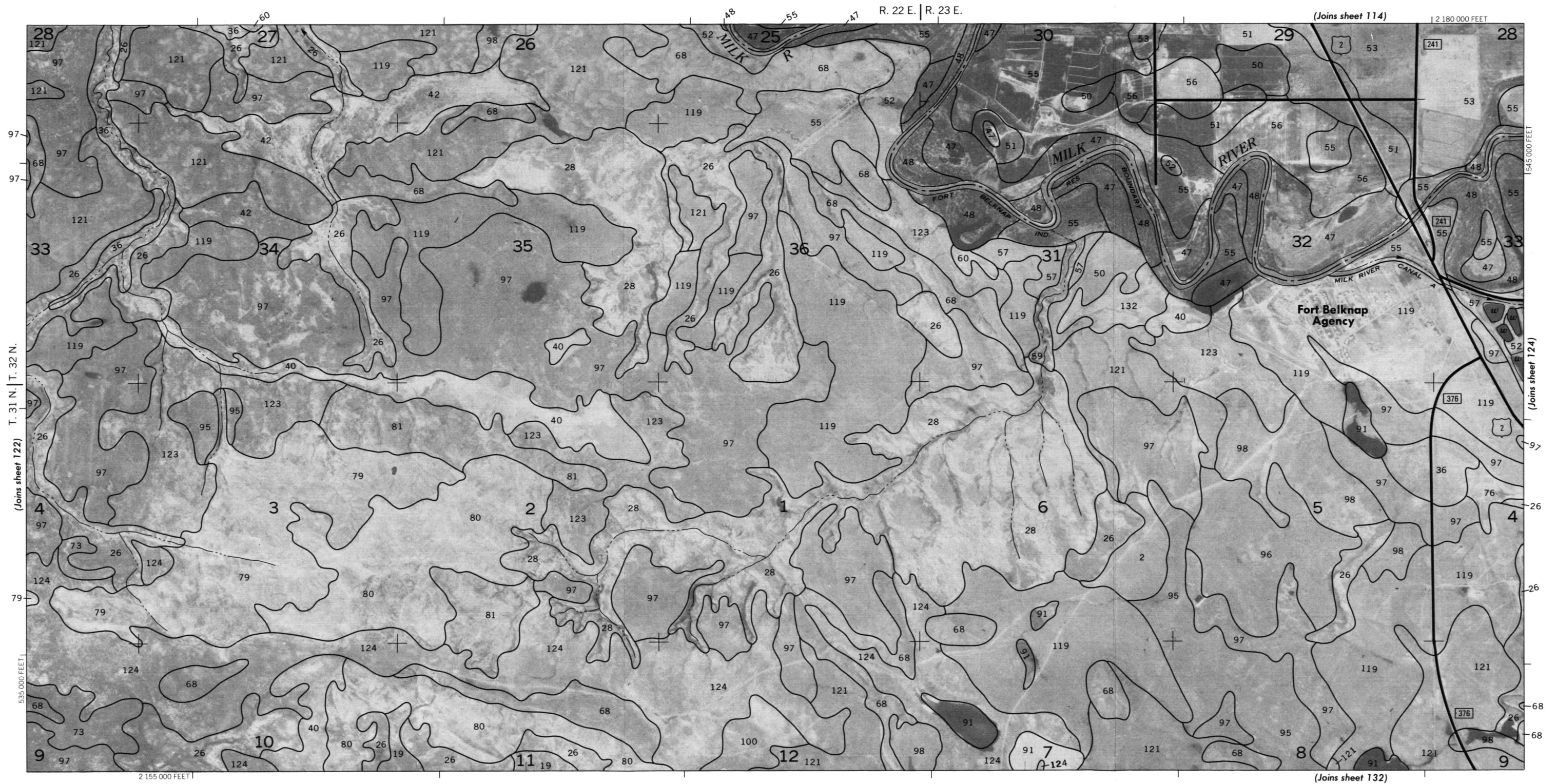


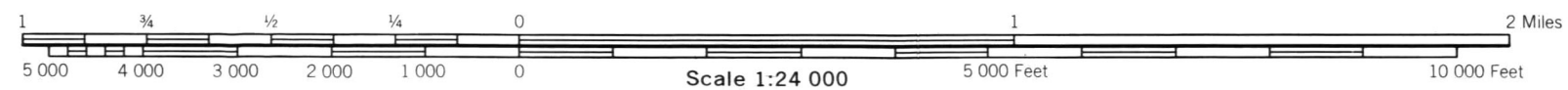


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

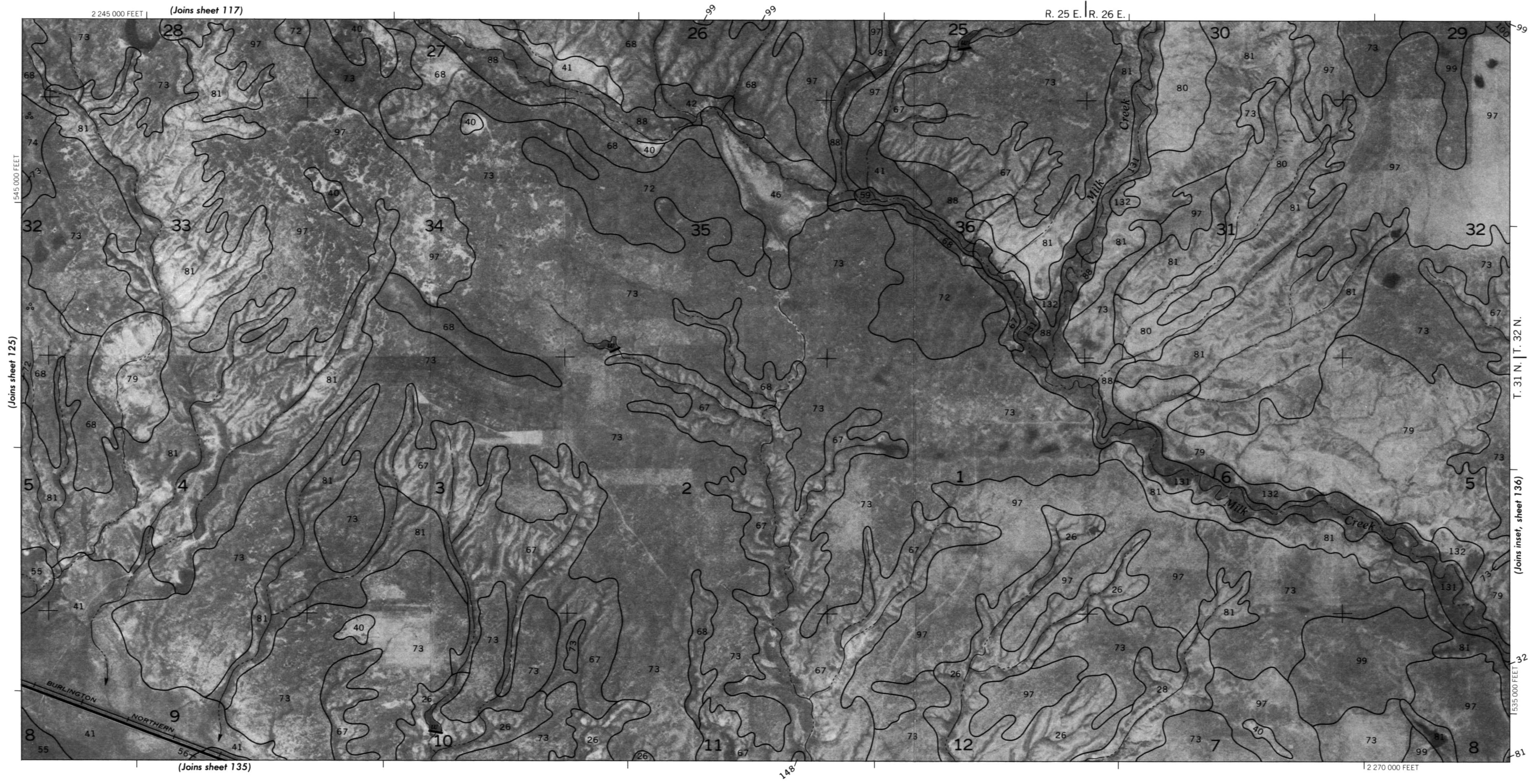
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 123

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





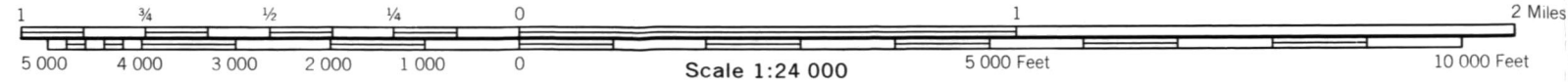
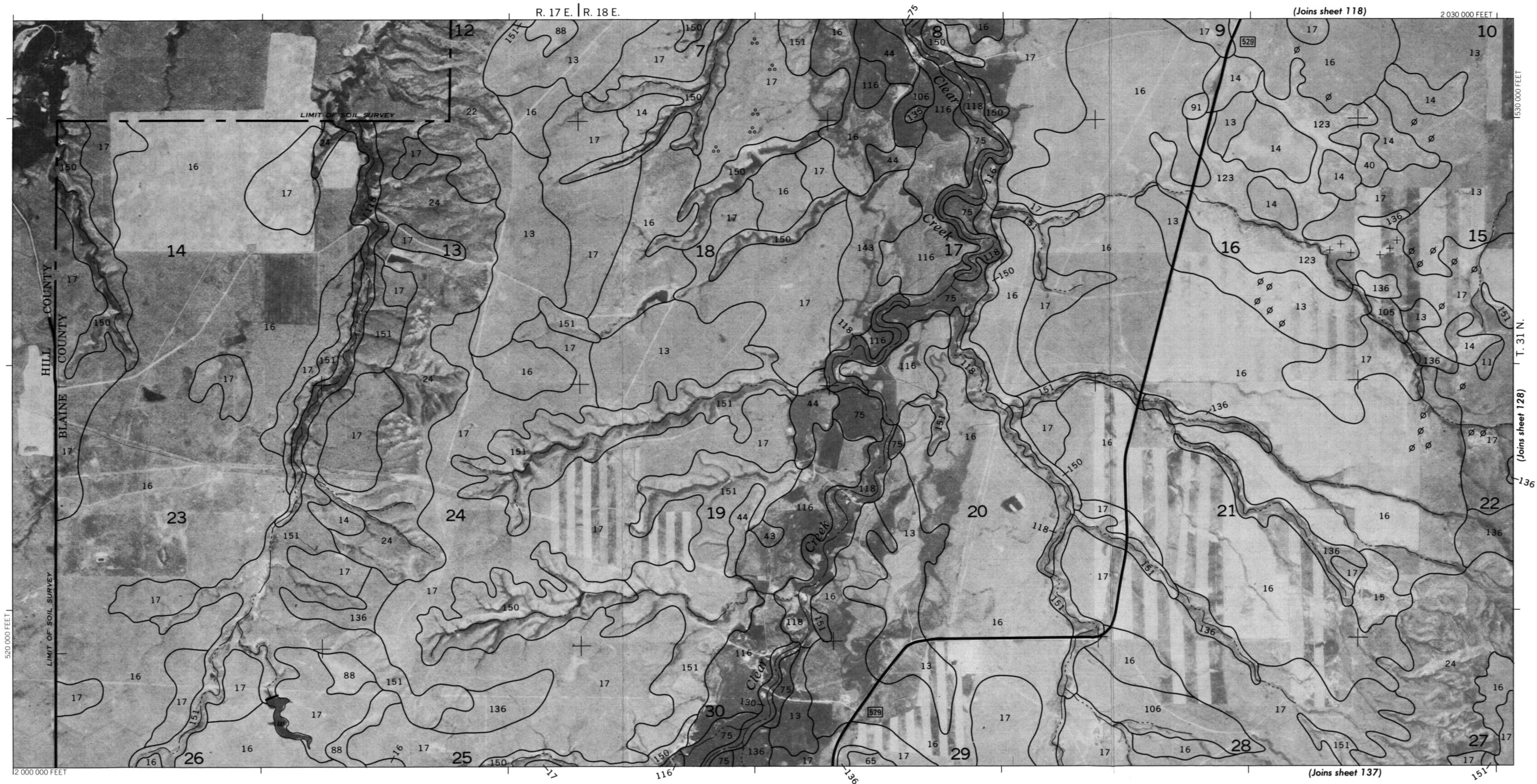
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

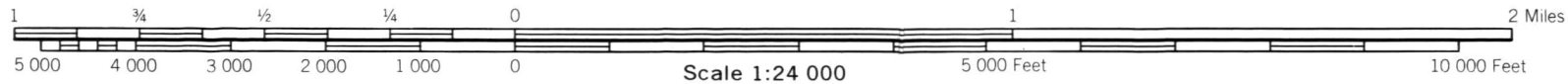


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 127

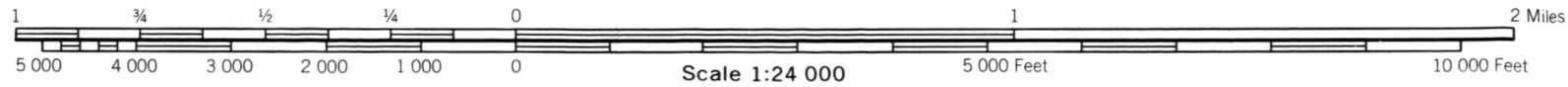
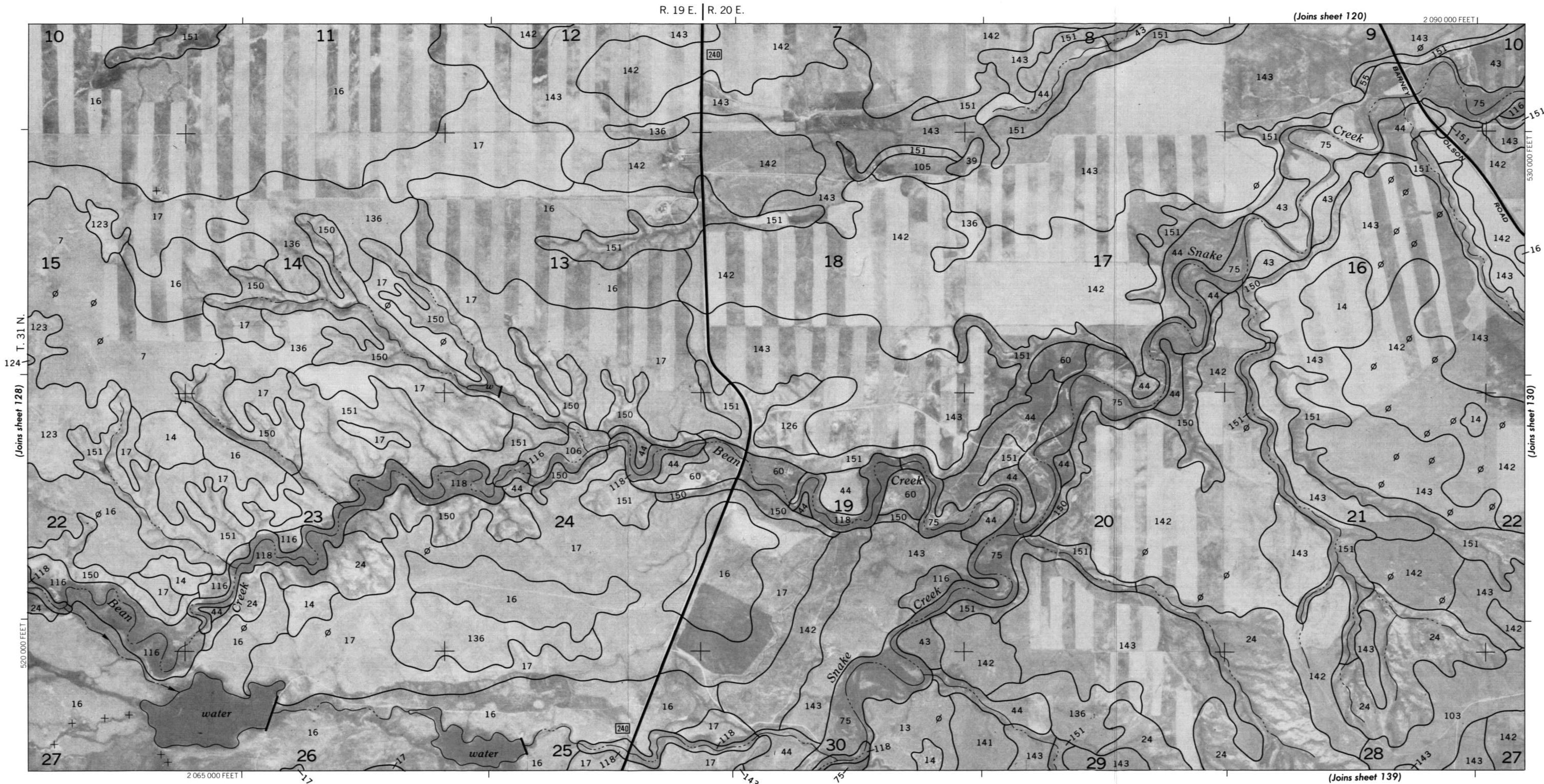


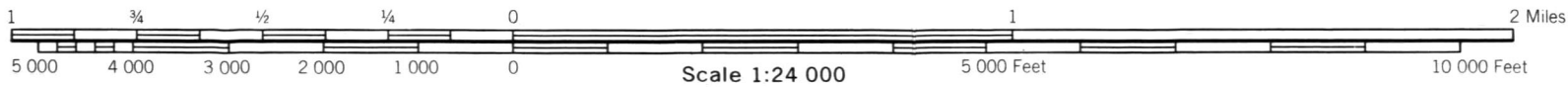
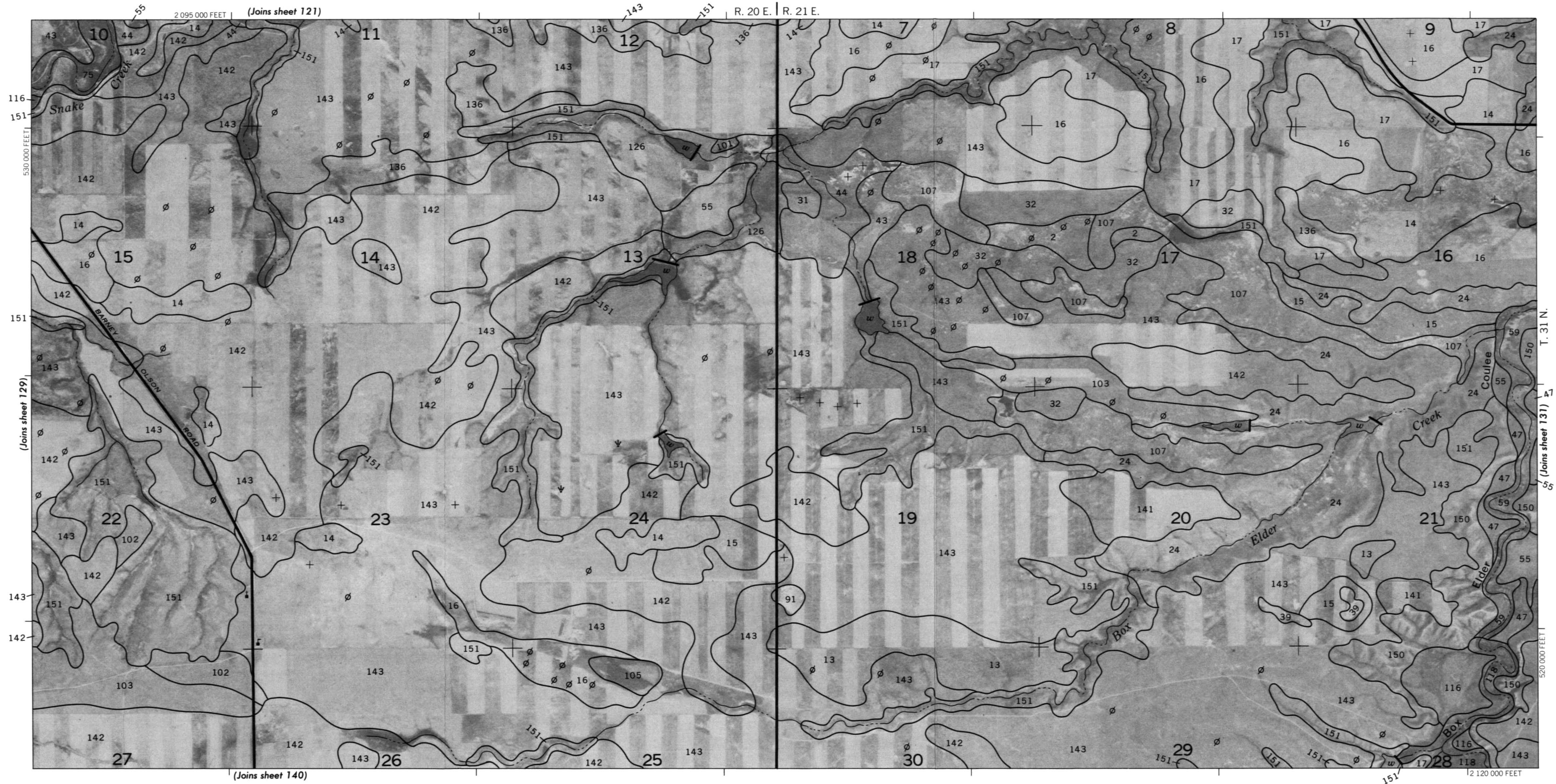


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 128

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 129

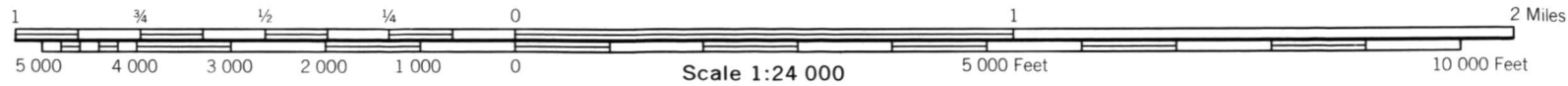


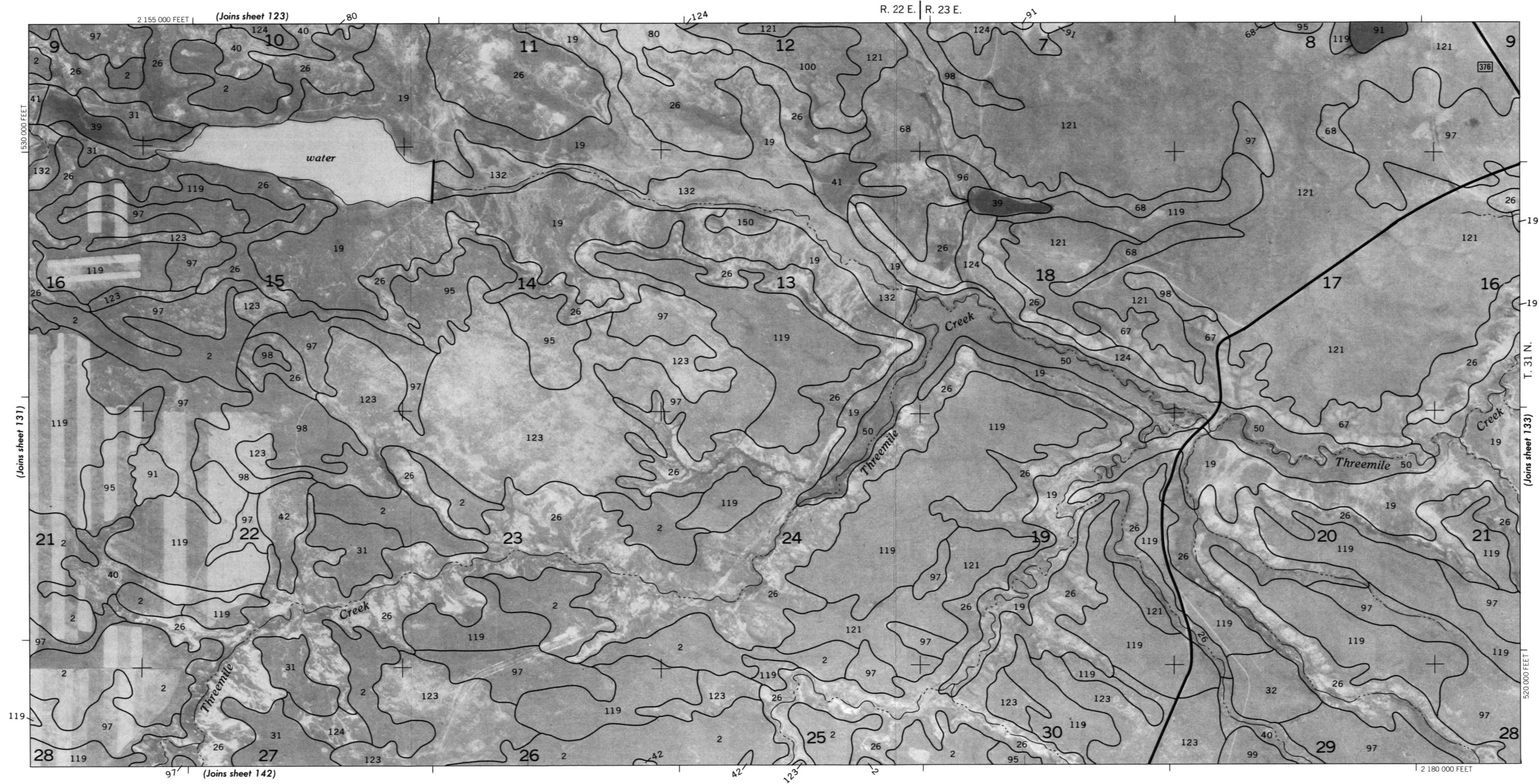


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

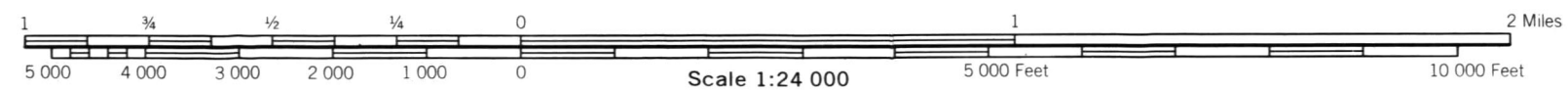
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 131



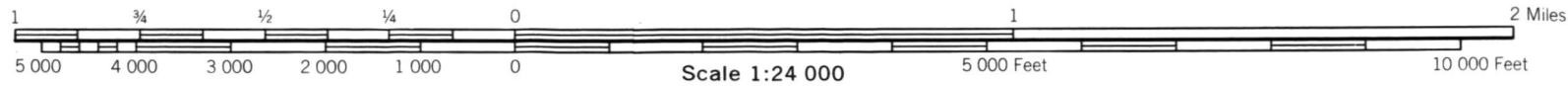
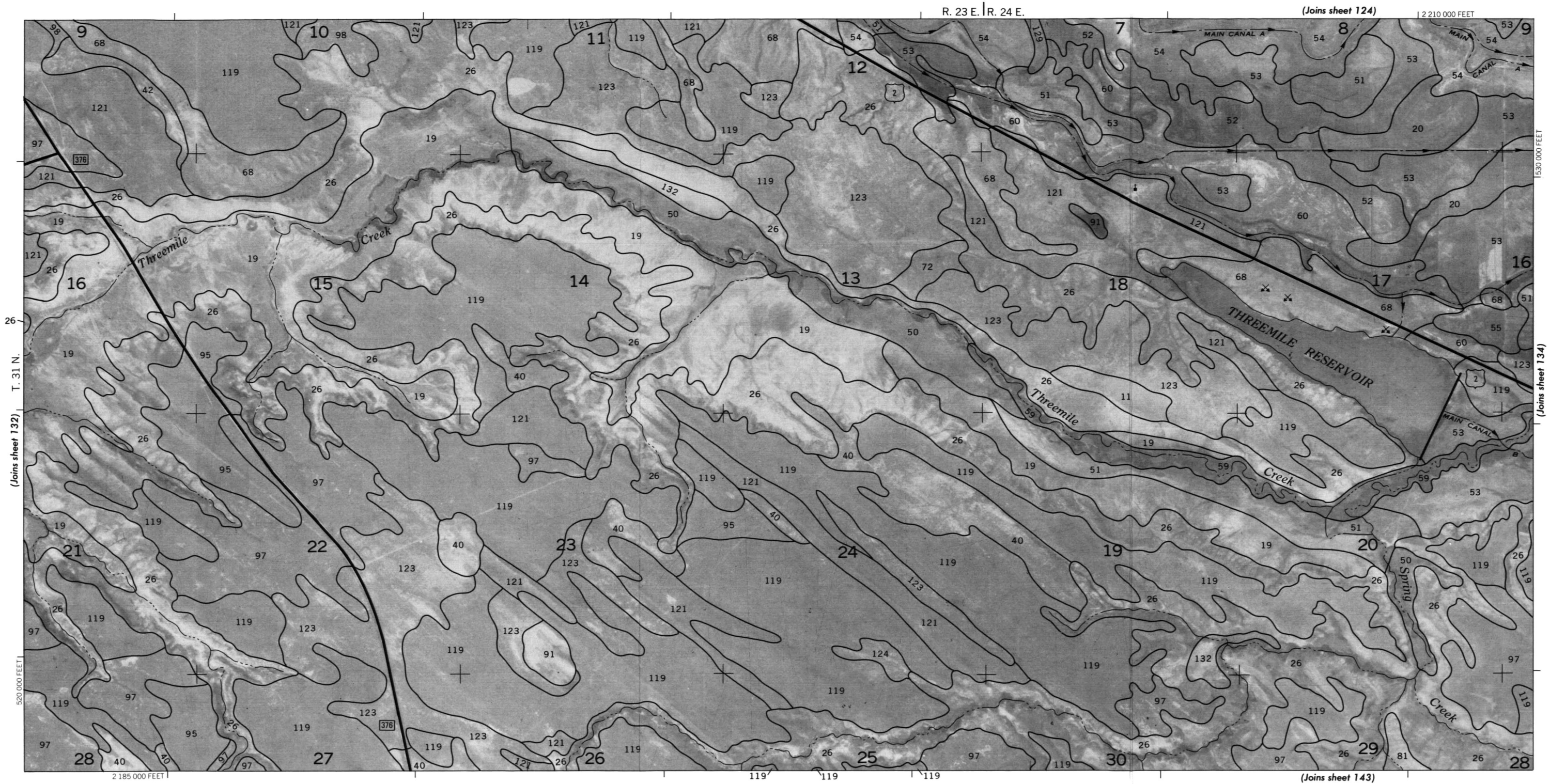


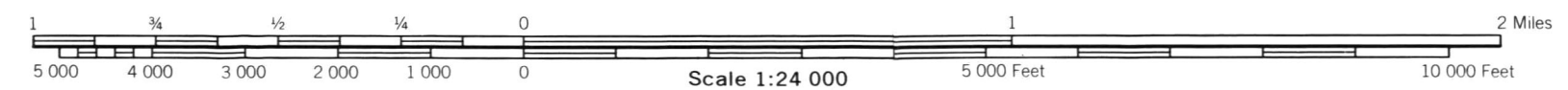
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 133

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



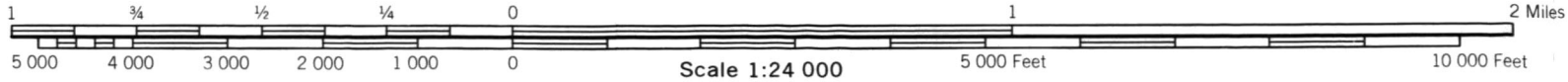


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



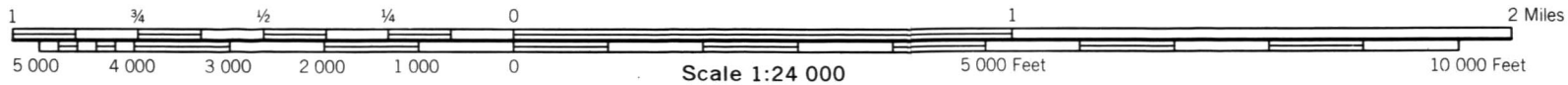
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 135

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





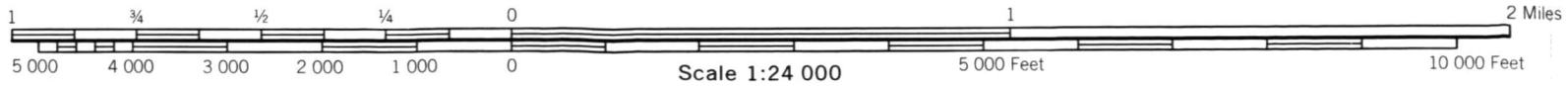
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.





BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 137

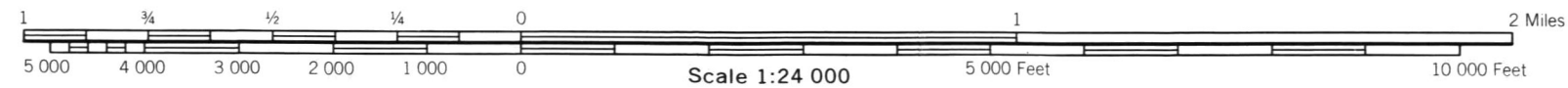
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 138



R. 19 E. | R. 20 E.

(Joins sheet 129)

2 090 000 FEET |

1515 000 FEET

coins sheet 140) |

-116

-130

T. 30 N. | T. 31 N. | (Joins sheet 138)

505 000 FEET I

2.065.000 FF

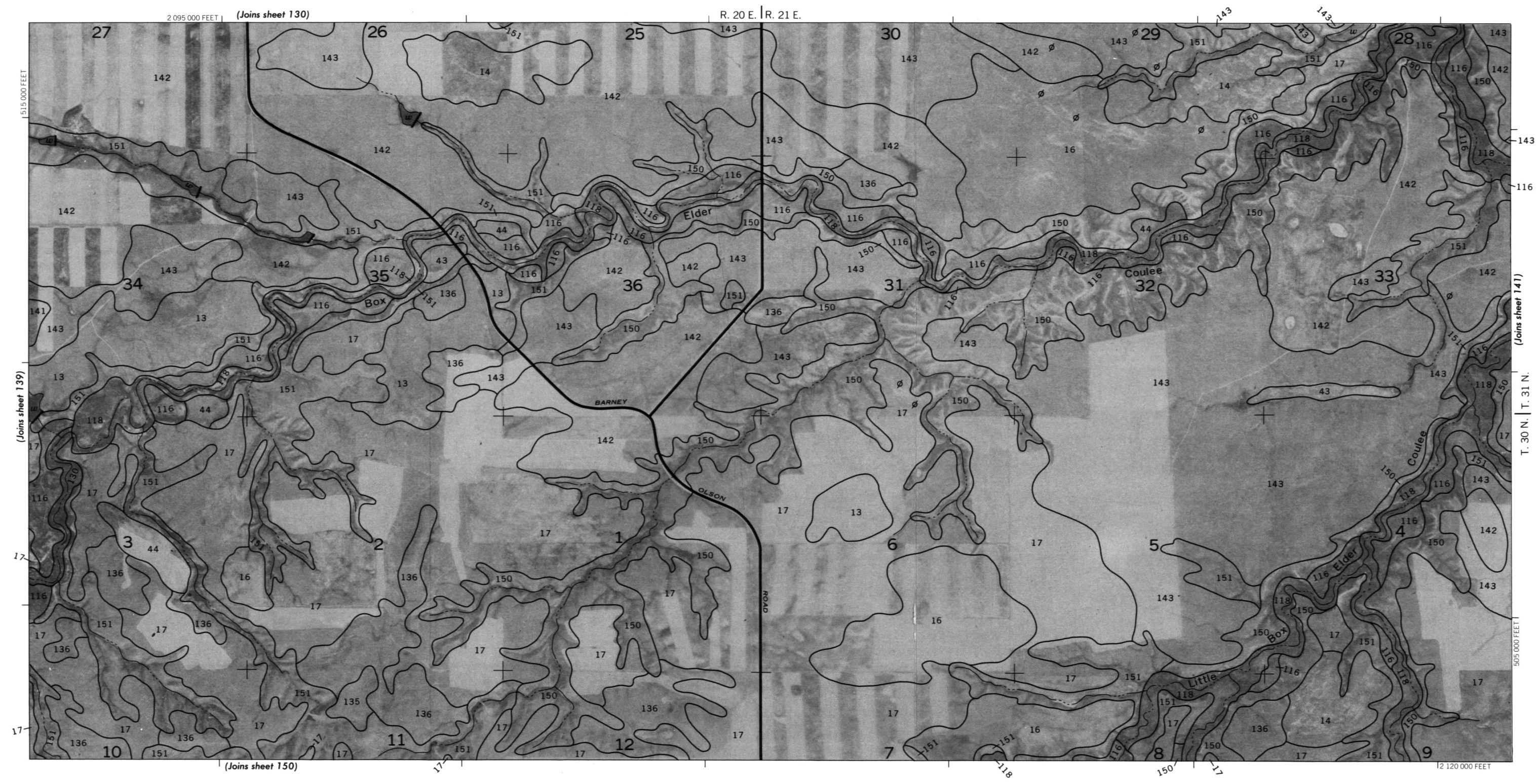
(joins sheet 149)

2.

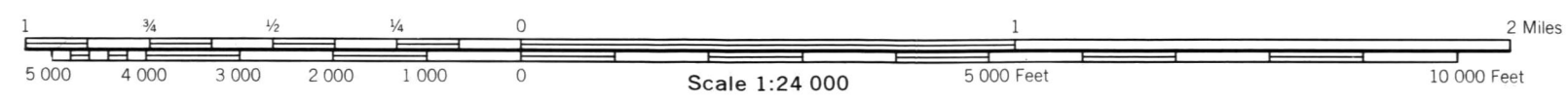
Scale 1:24 000

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 139

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

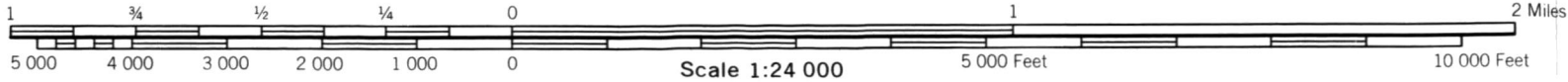
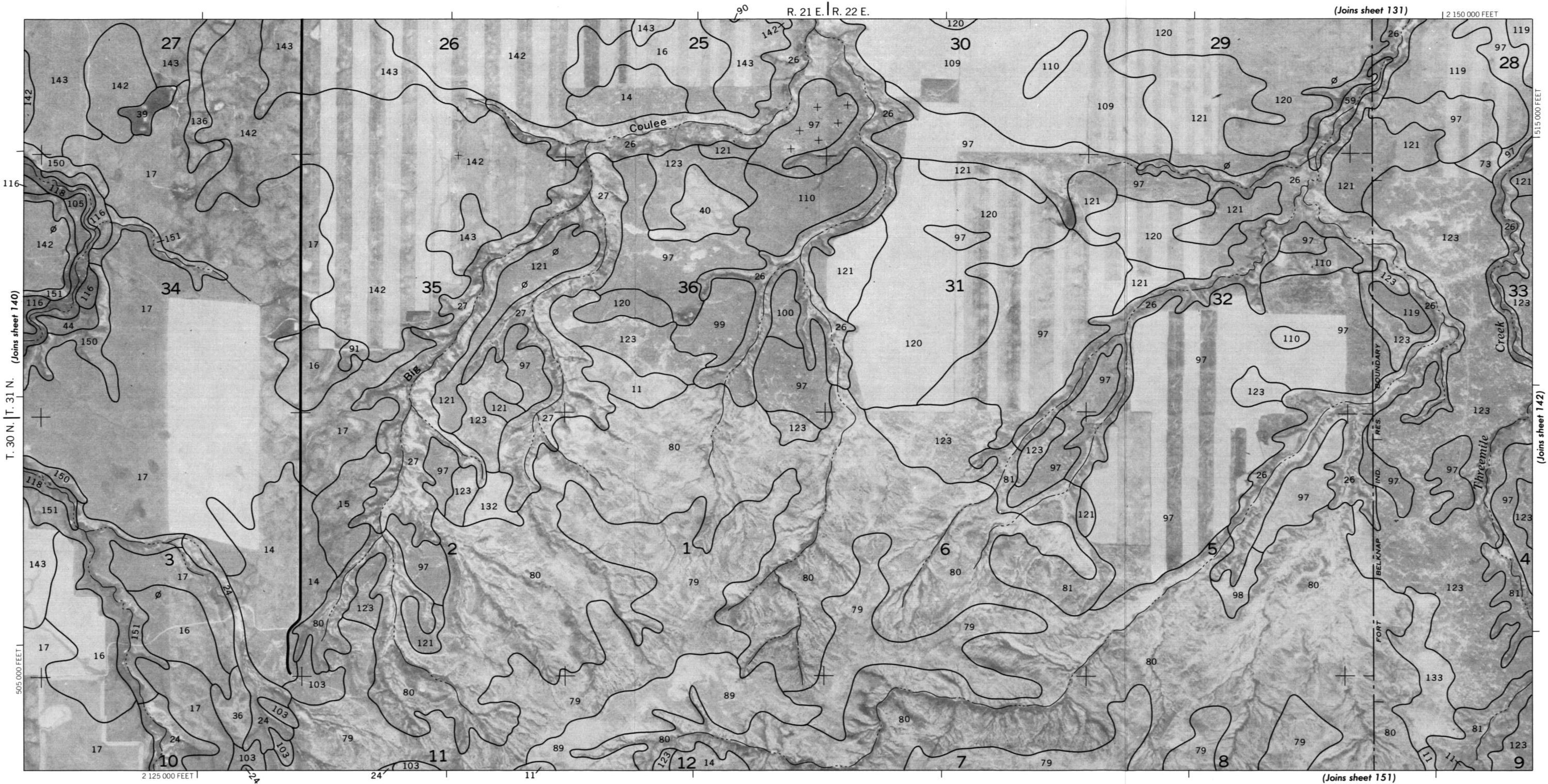


Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 141

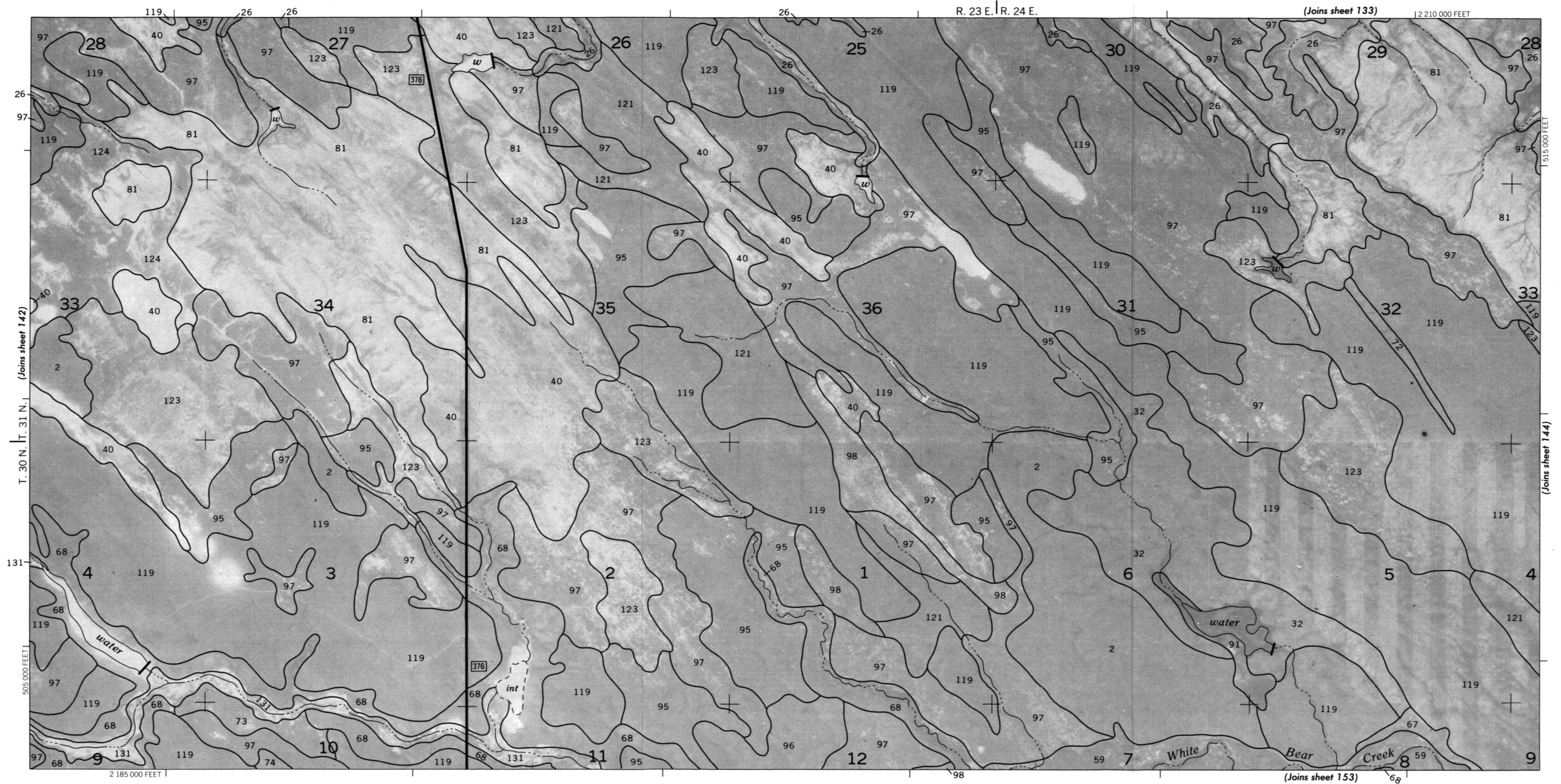




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 143

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



T. 30 N. | T. 31 N. | (Joins sheet 142)

505 000 FEET I

2 185 000 FEET

R. 23 E. | R. 24 E.

(Joins sheet 133)

2 210 000 FEET

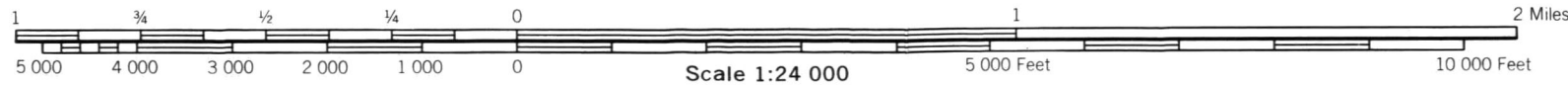
(Joins sheet 144)

(Joins sheet 153)

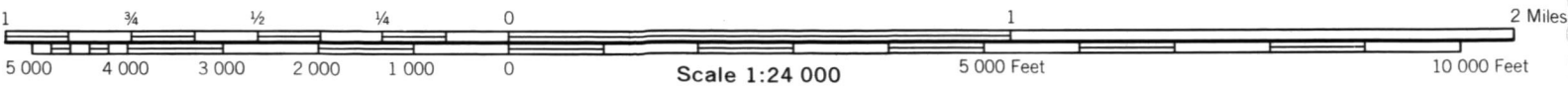
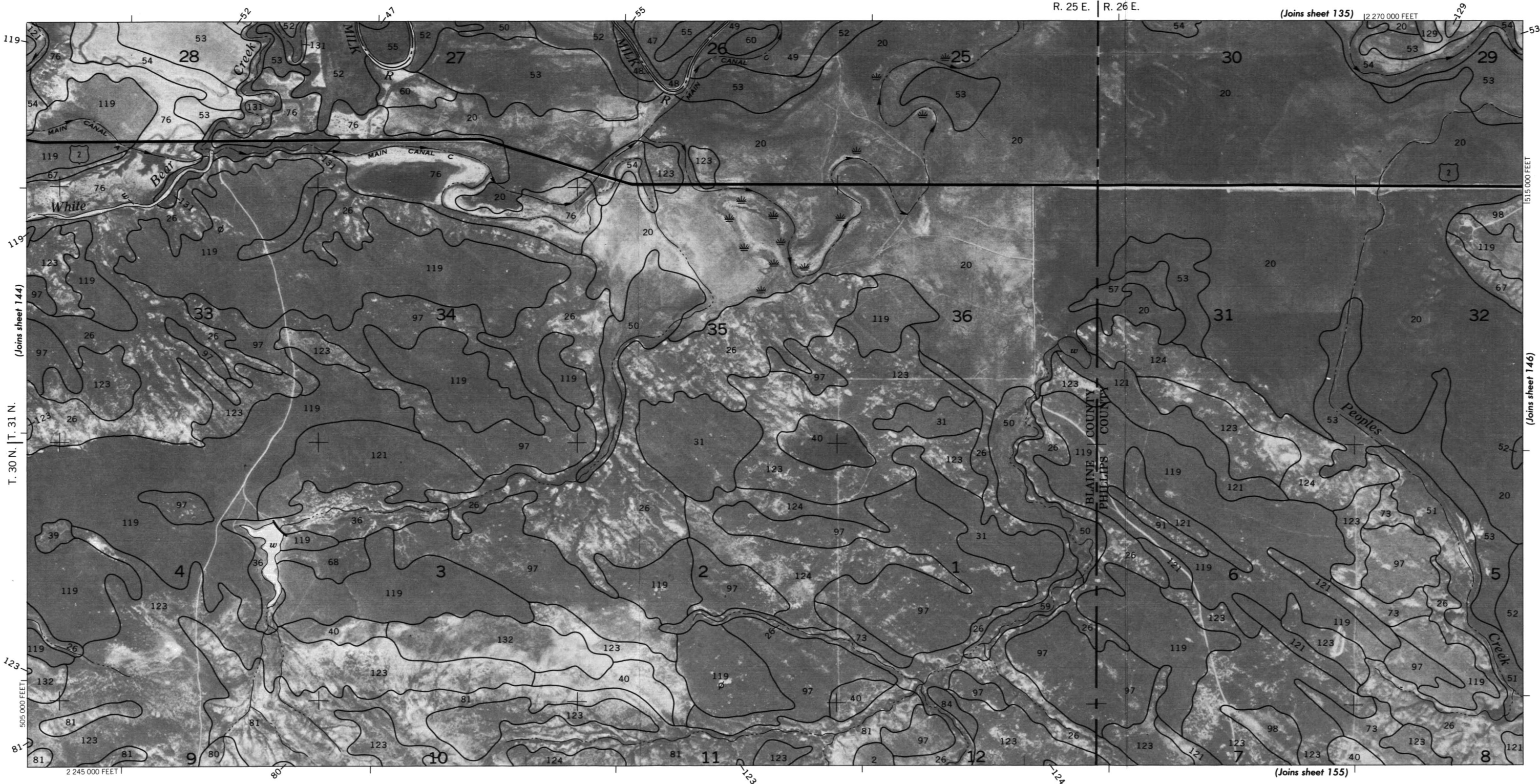
1 3/4 1/2 1/4 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet 10 000 Feet

Scale 1:24 000

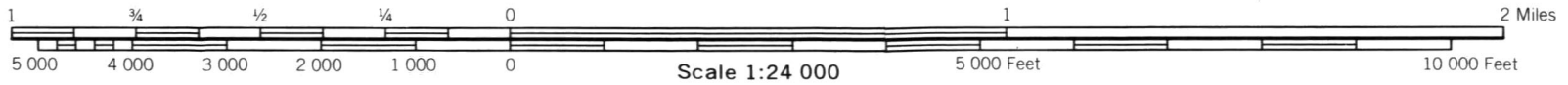
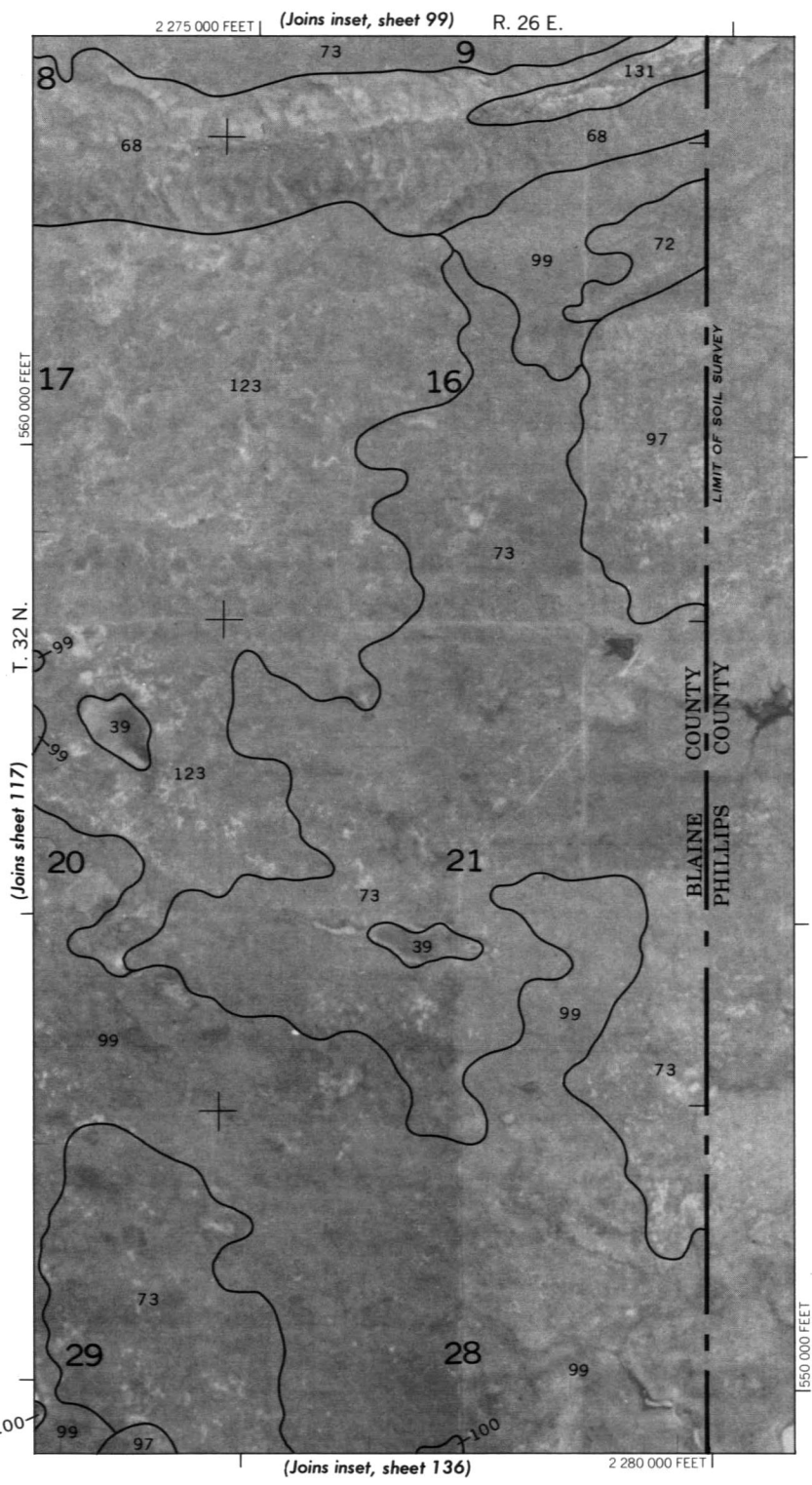
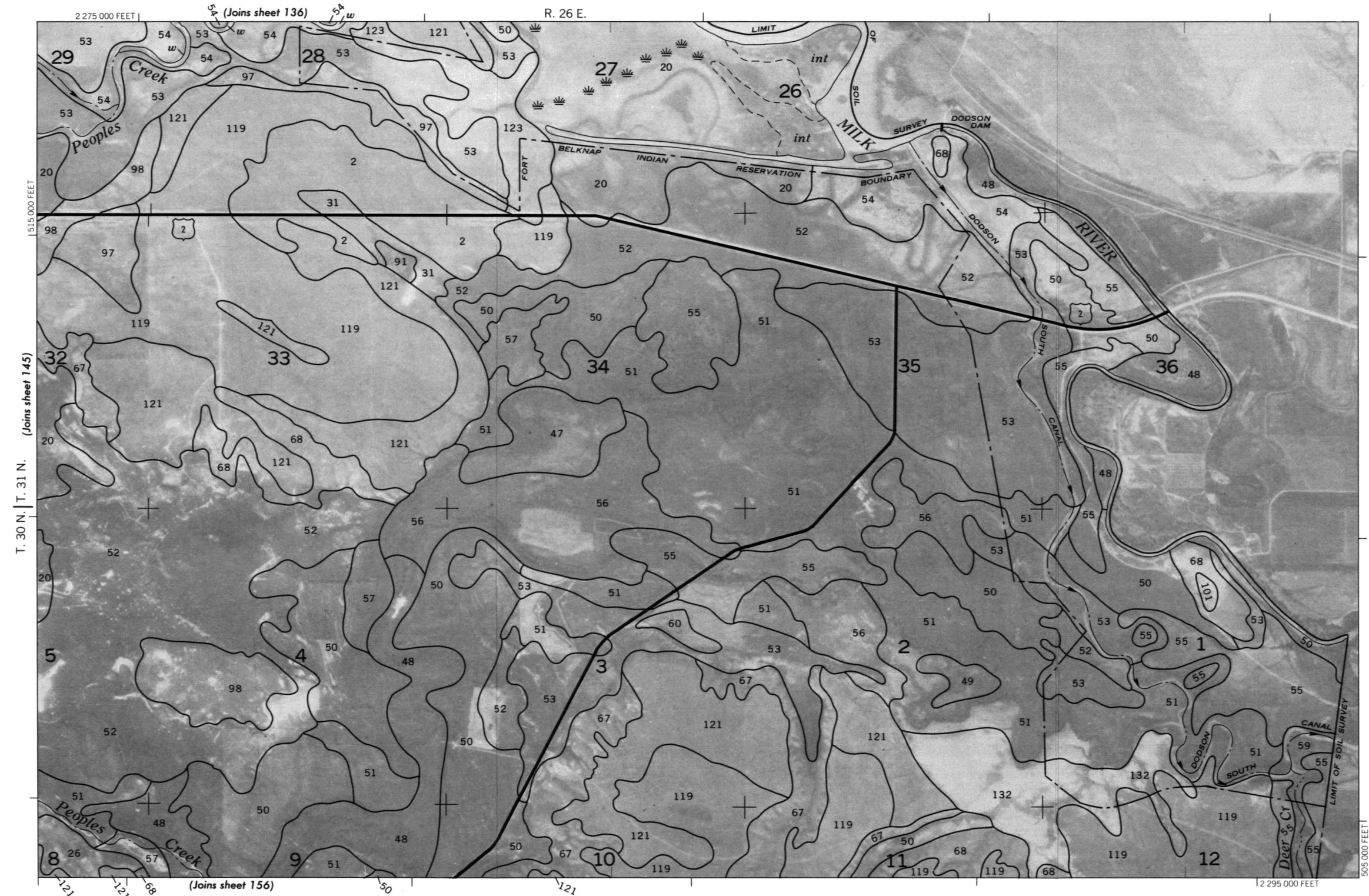


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 145

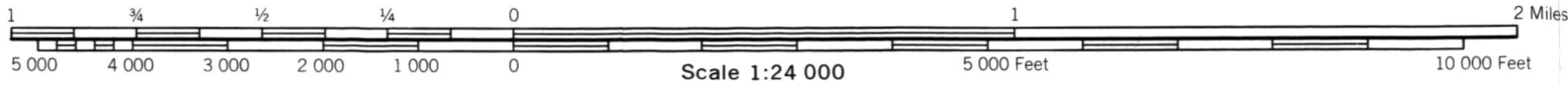
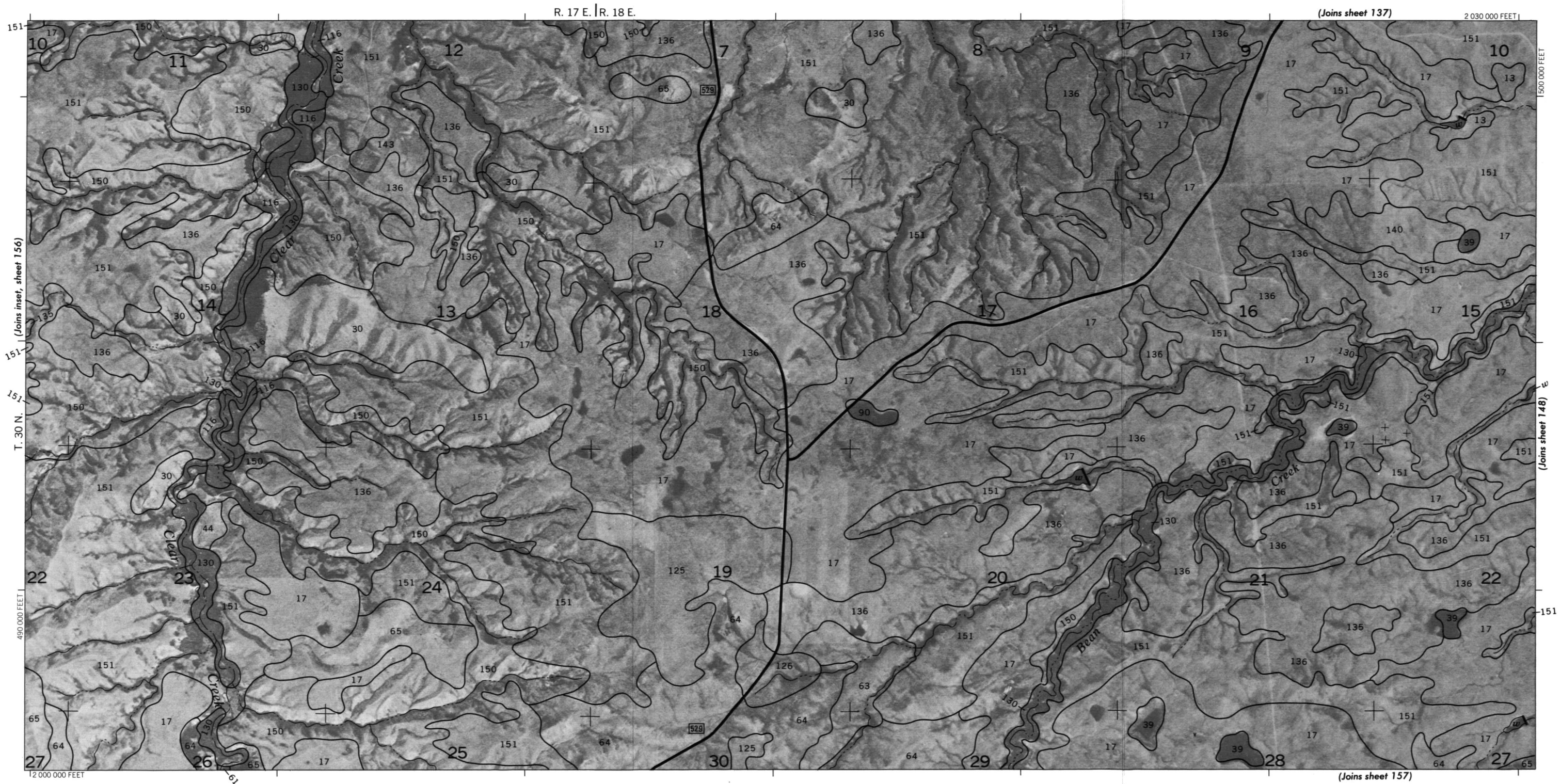
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

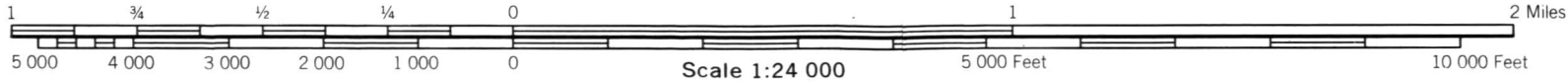
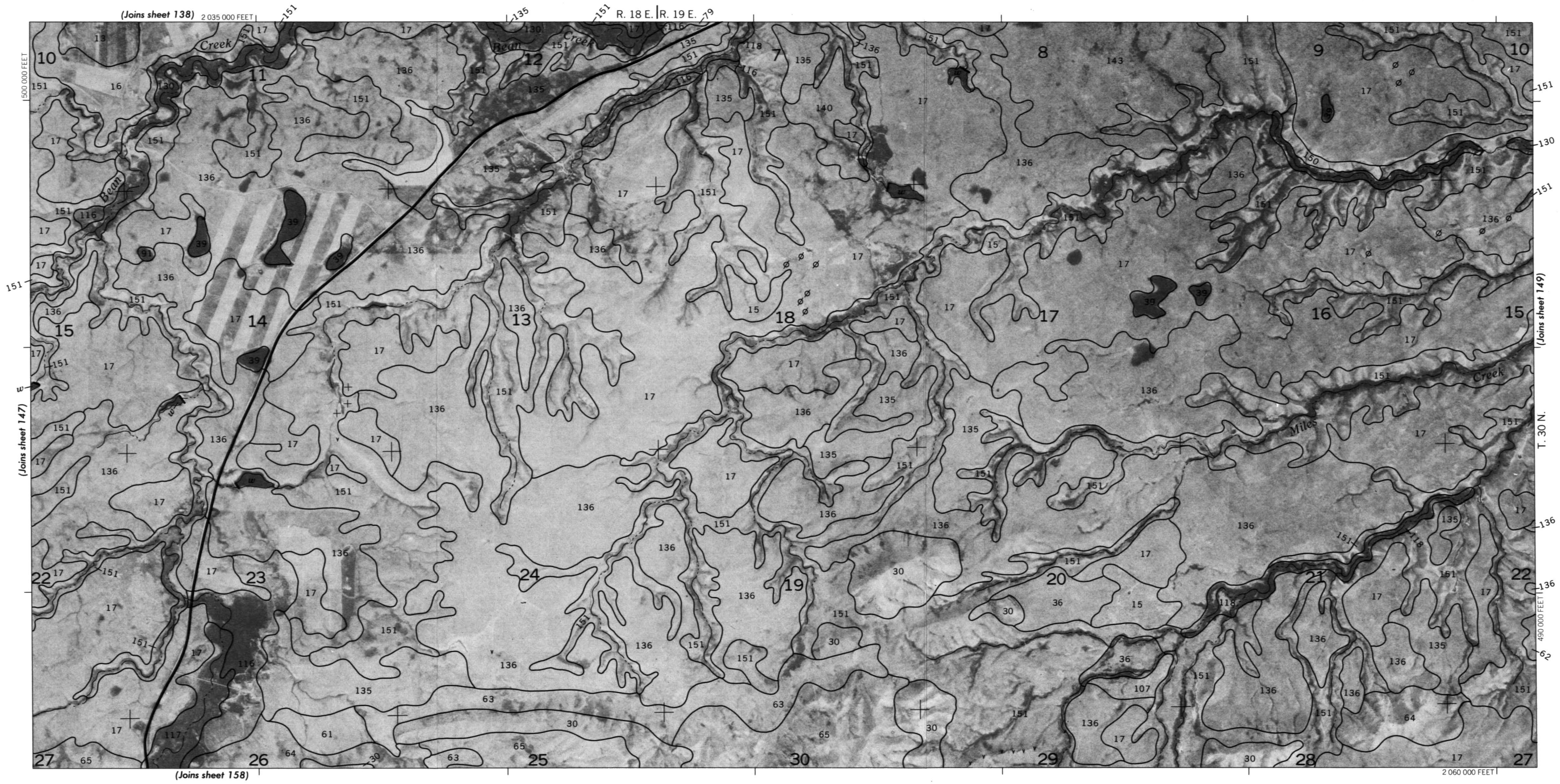


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 147

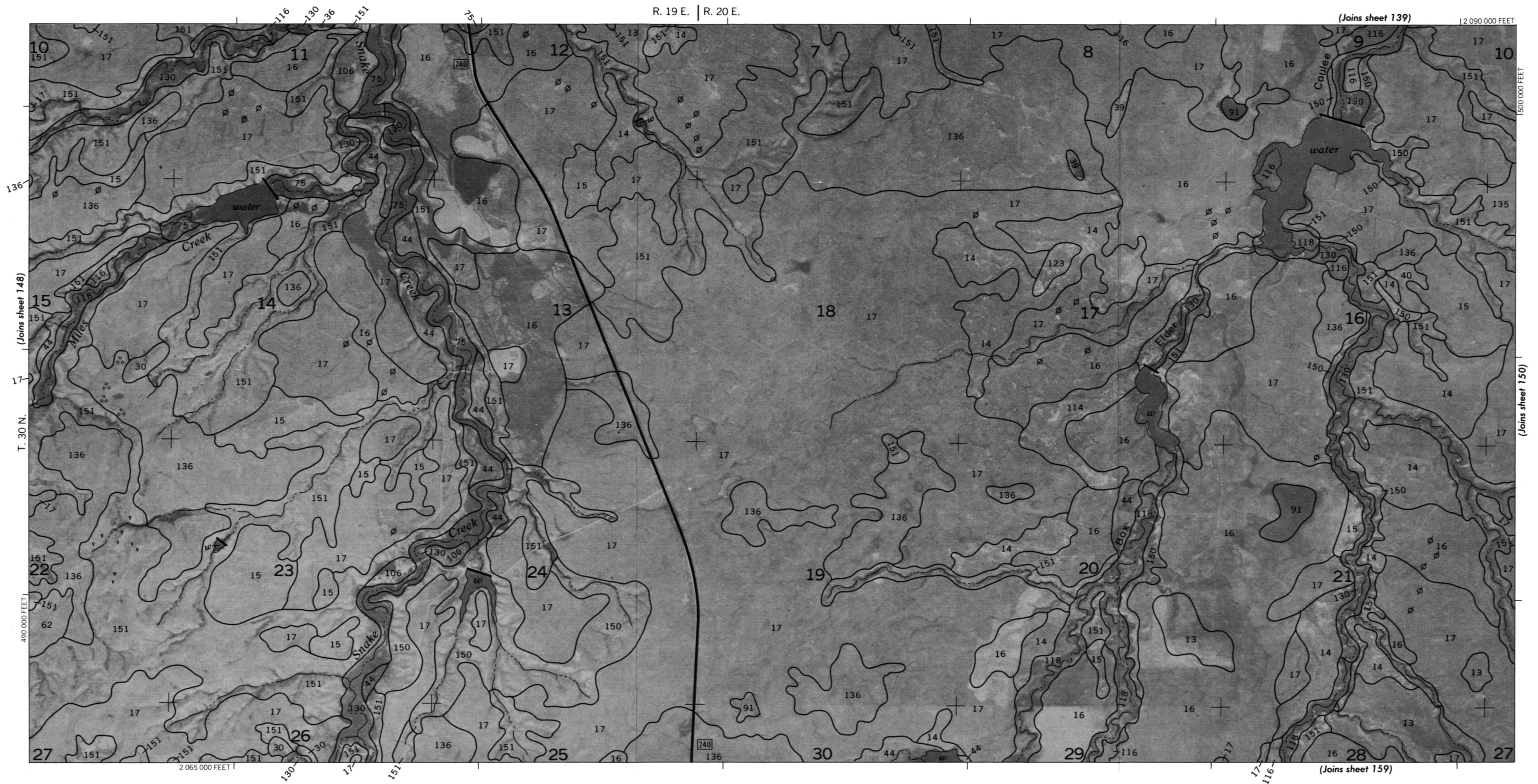




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

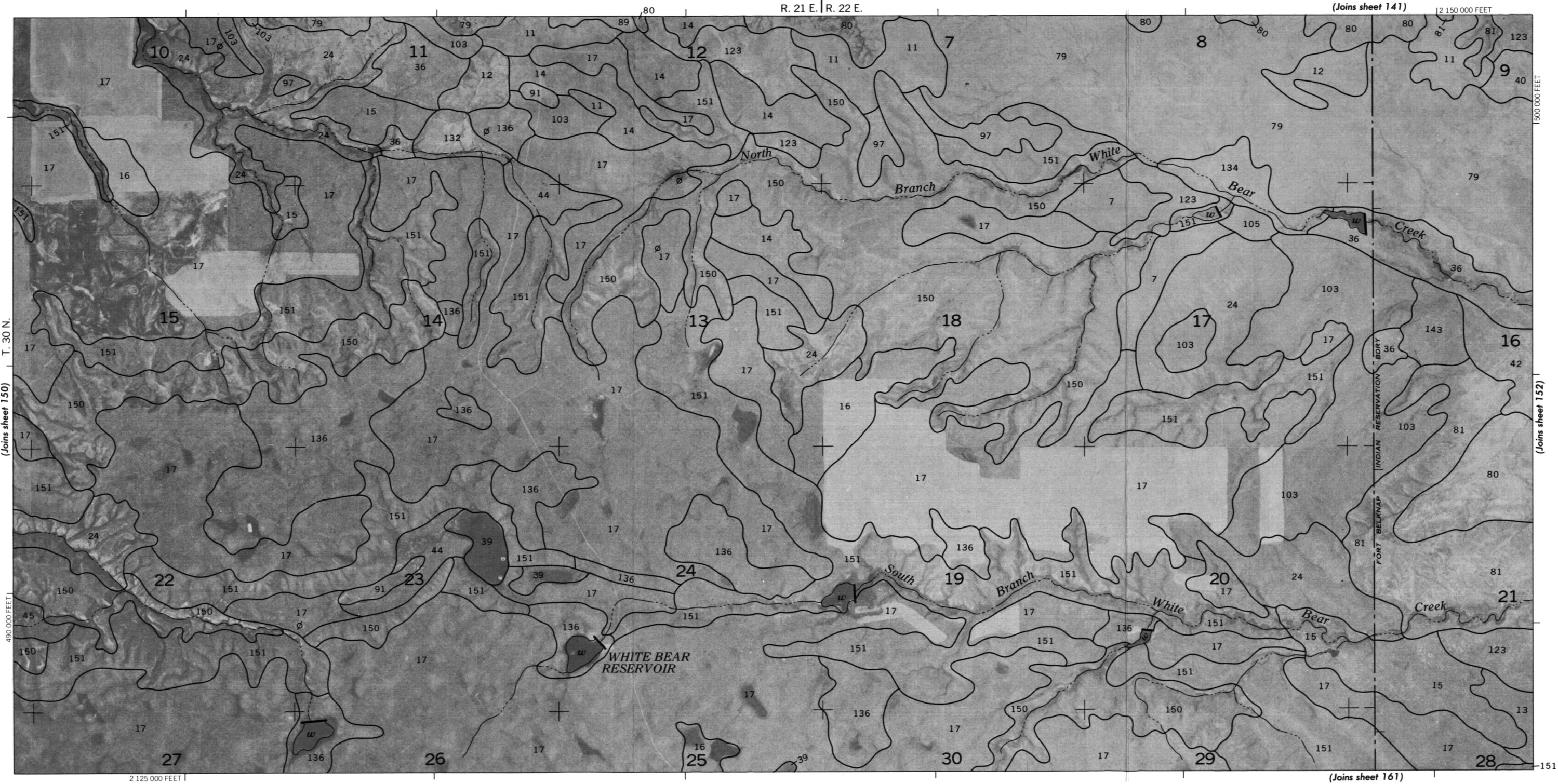
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 149

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



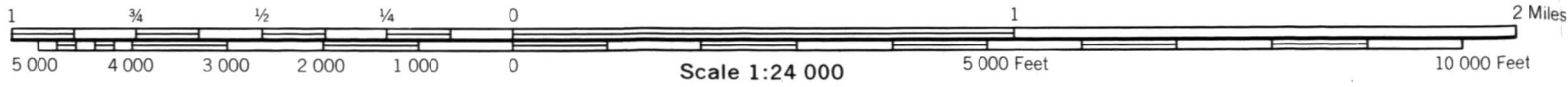


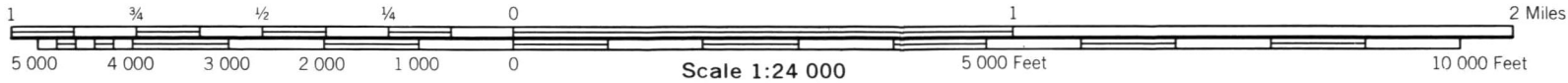
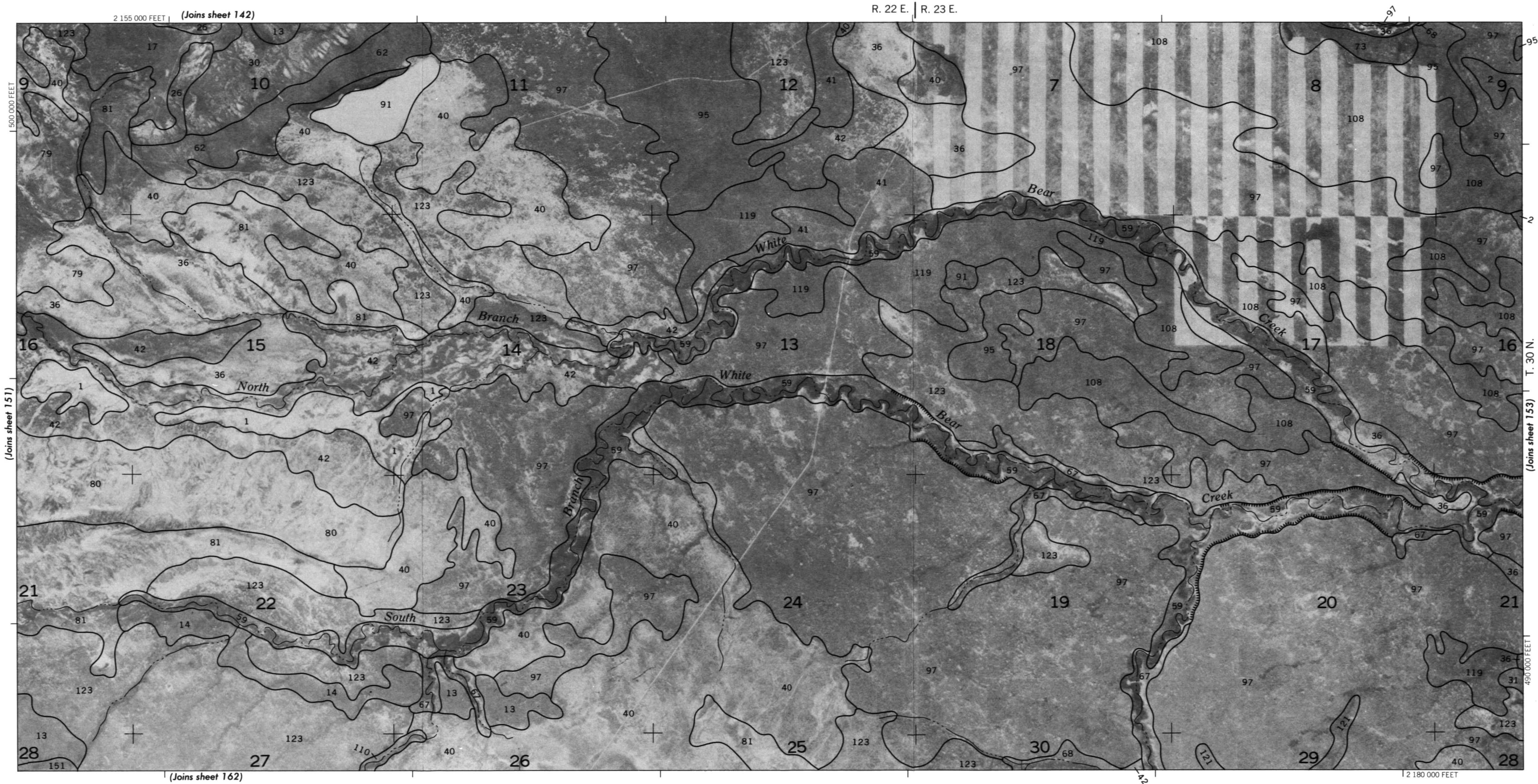
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 151

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

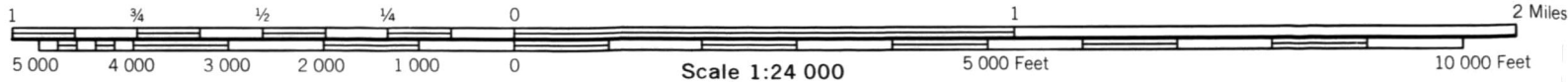
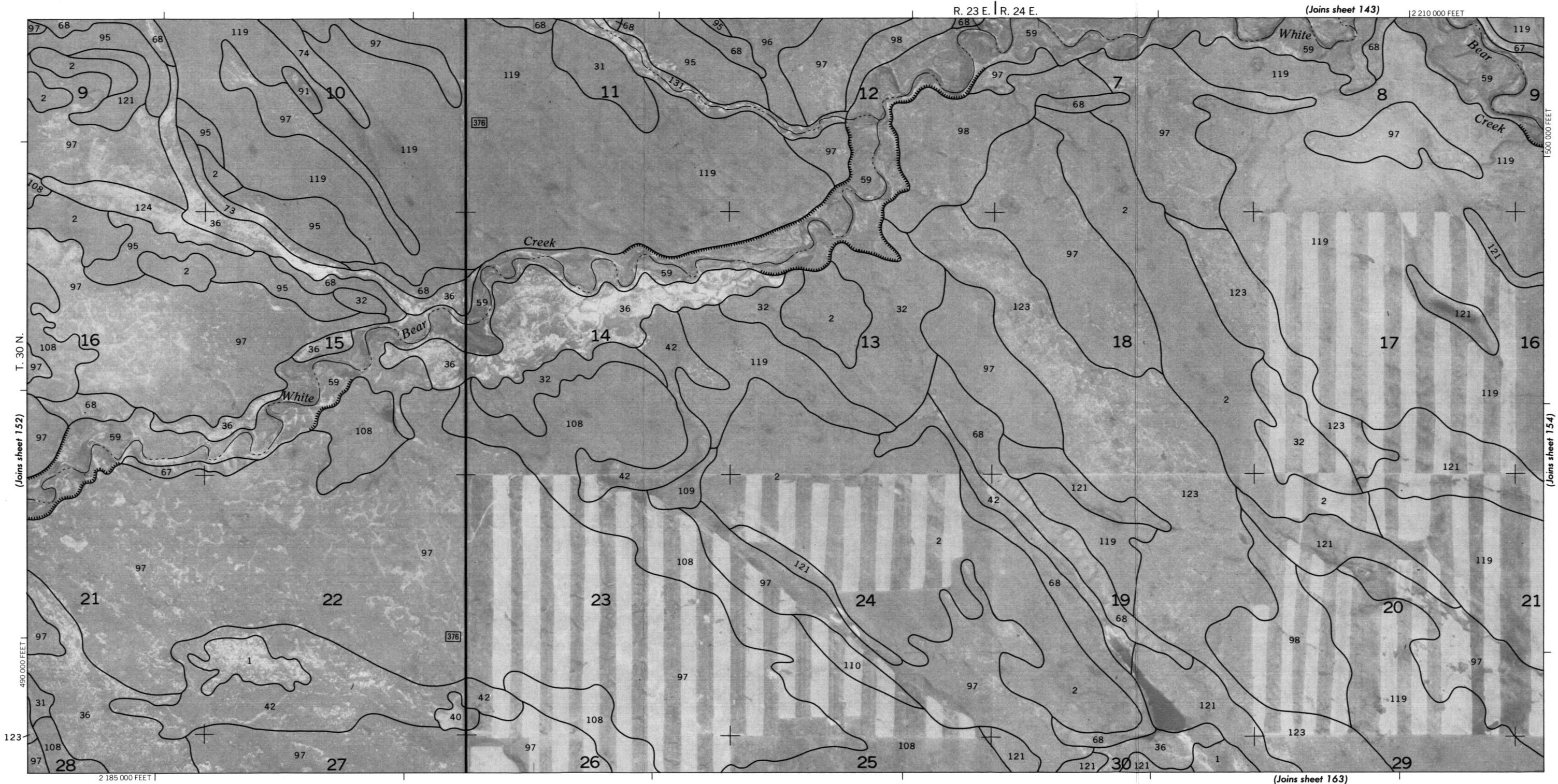


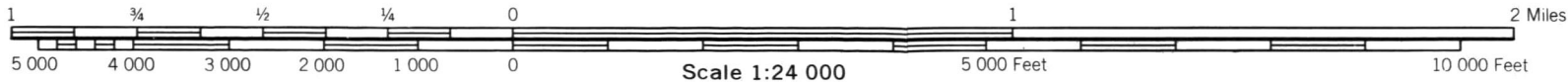


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 153

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

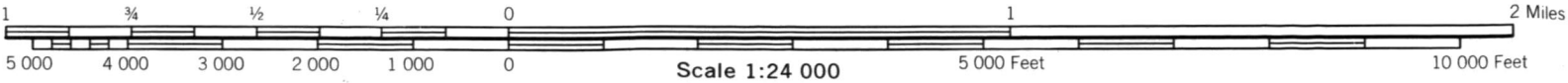
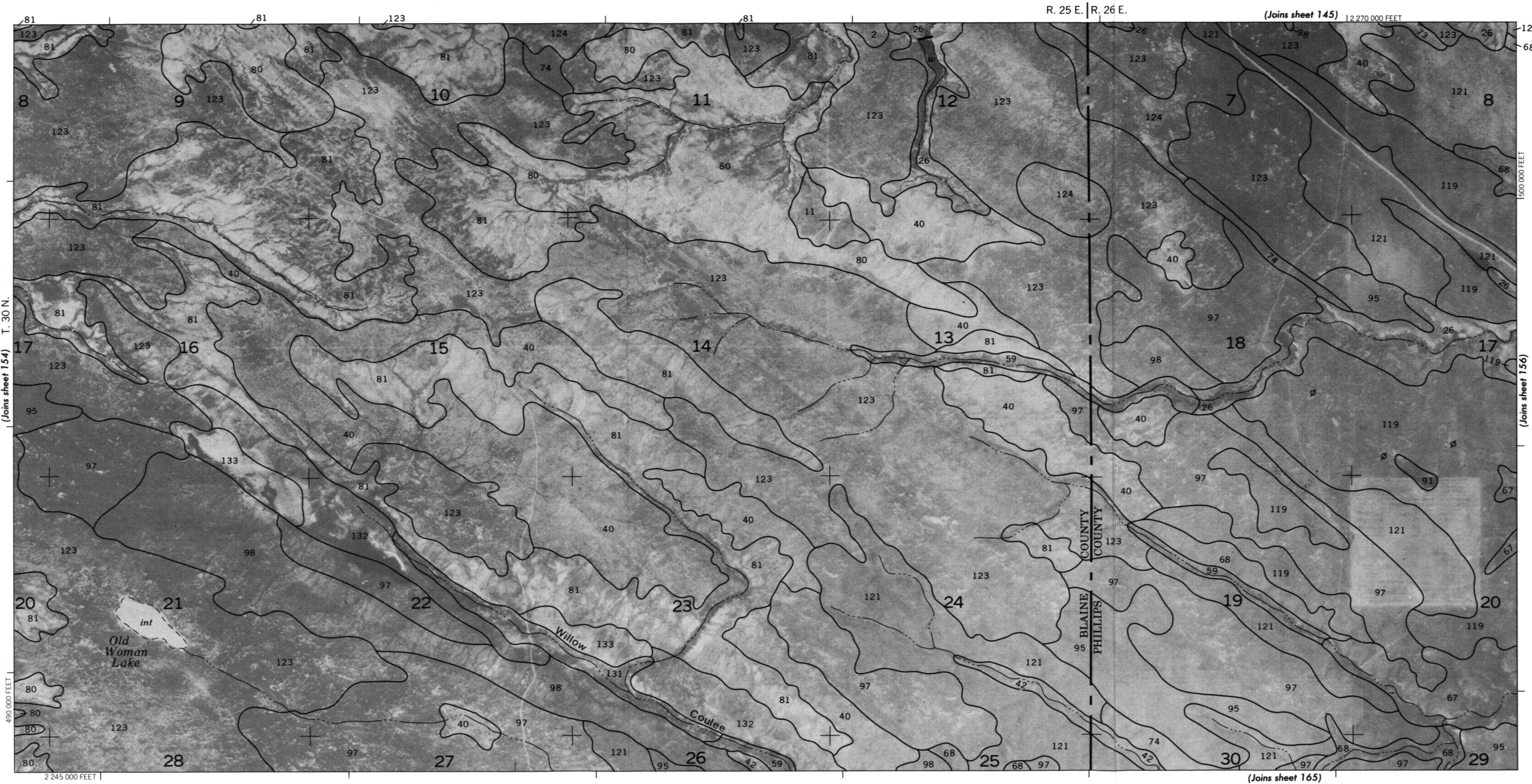


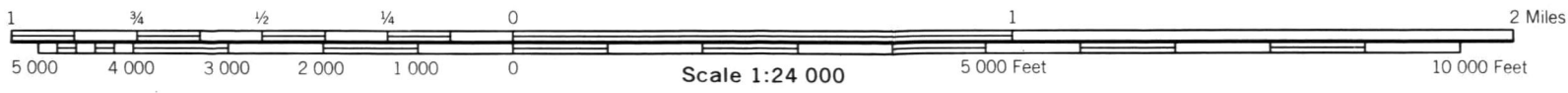
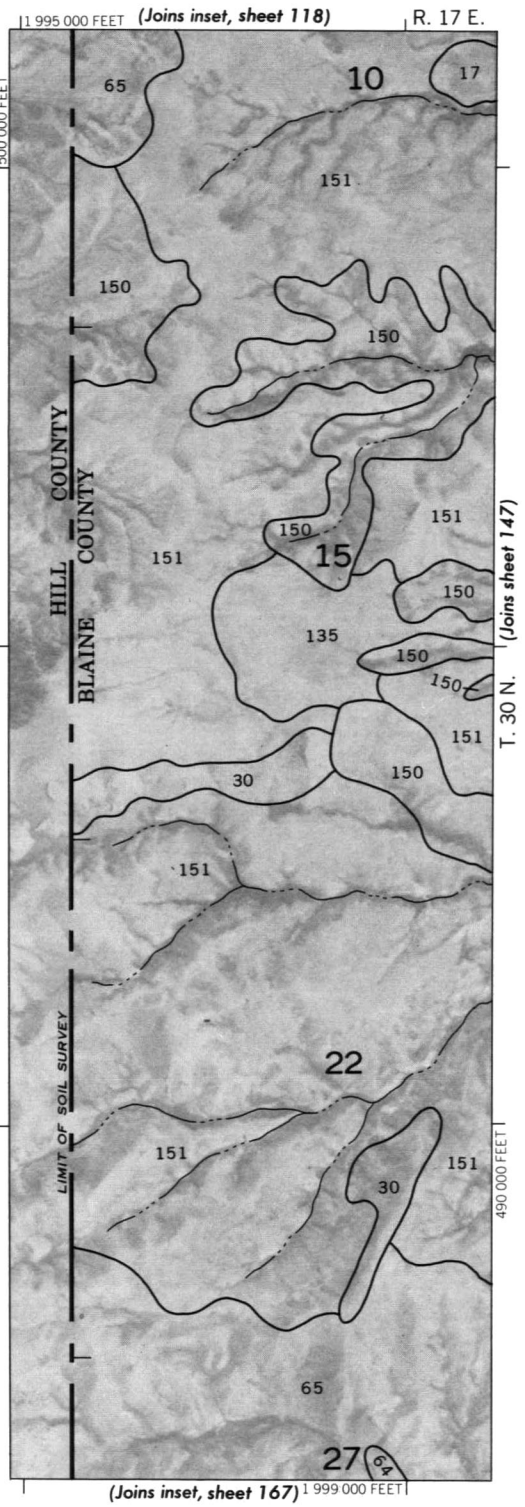
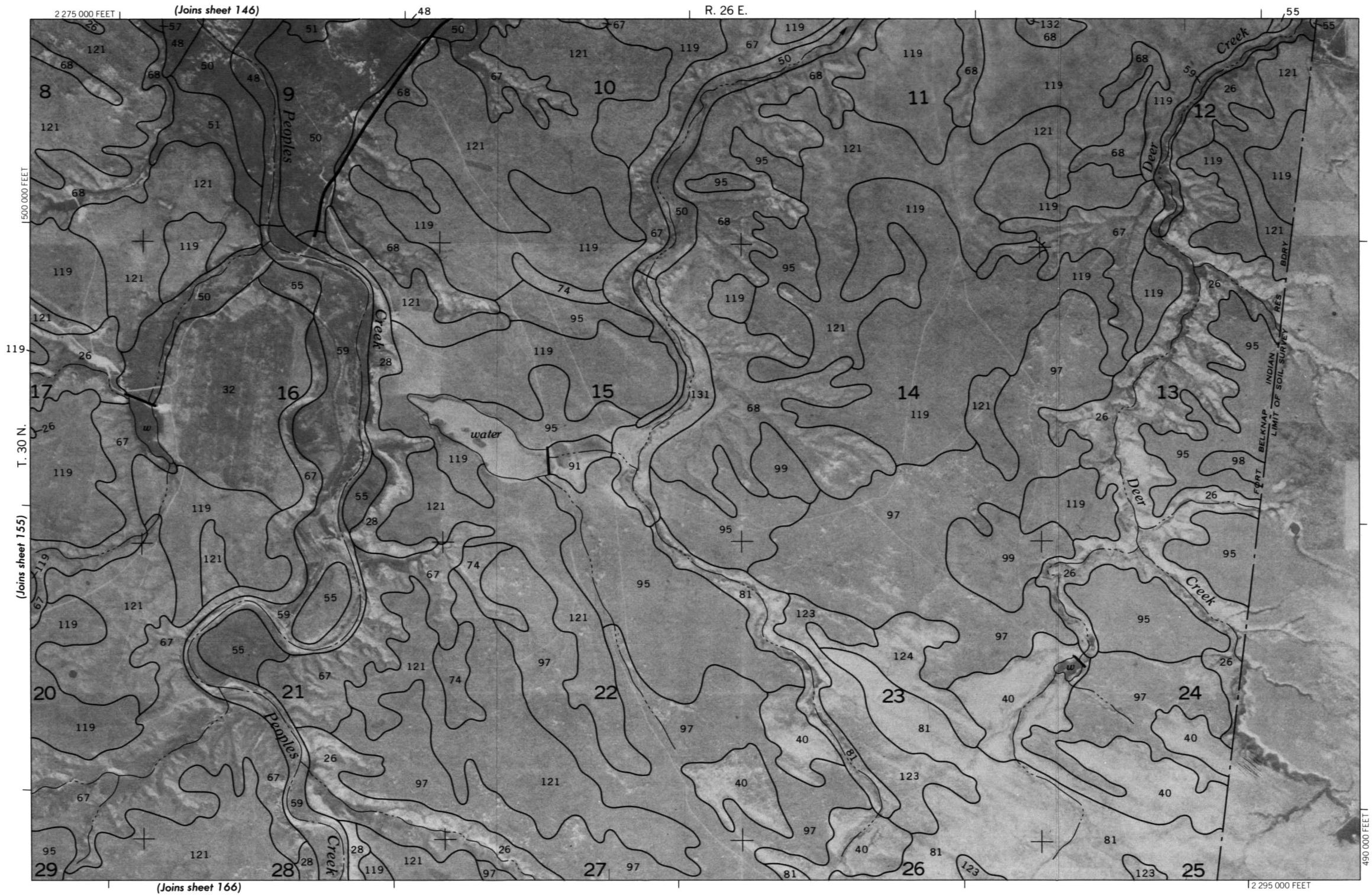


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 154

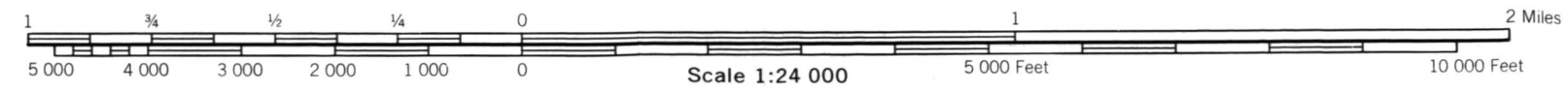
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 155

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



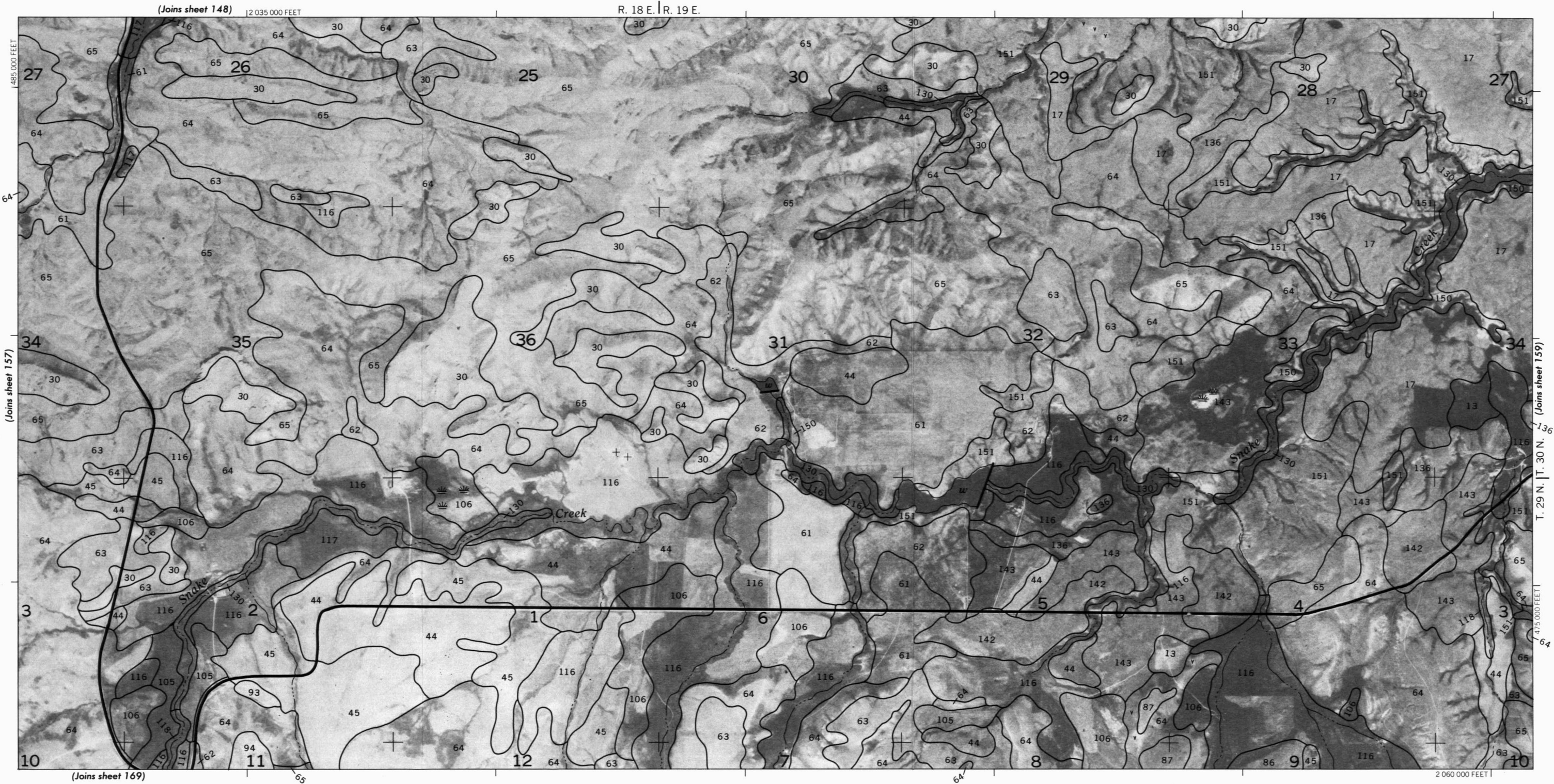


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 157

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



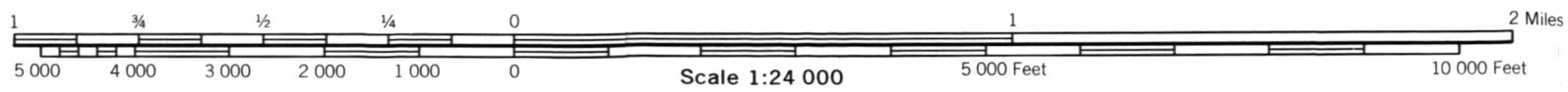
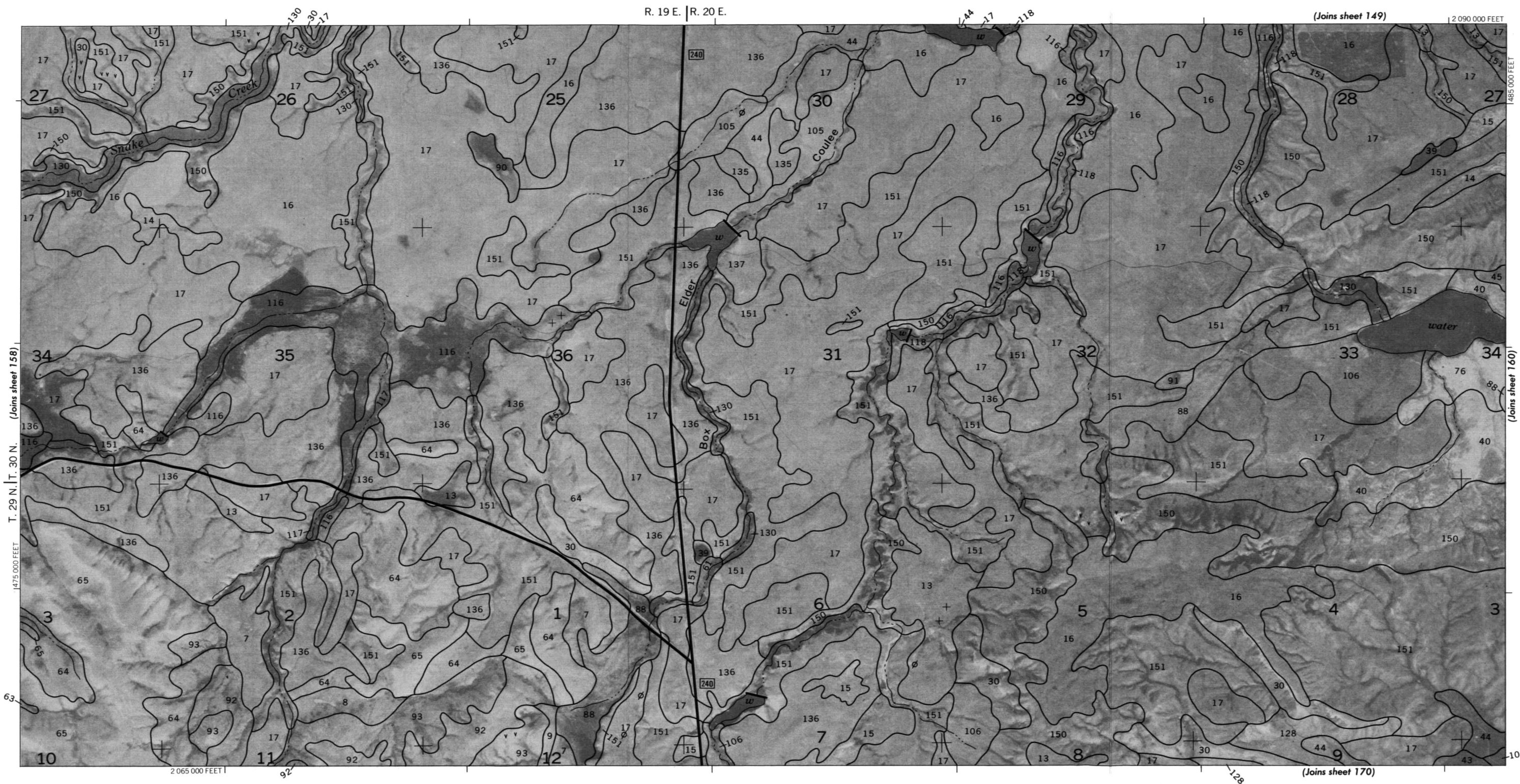
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

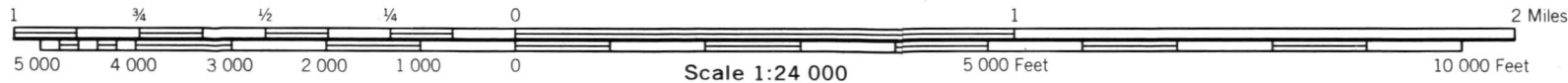
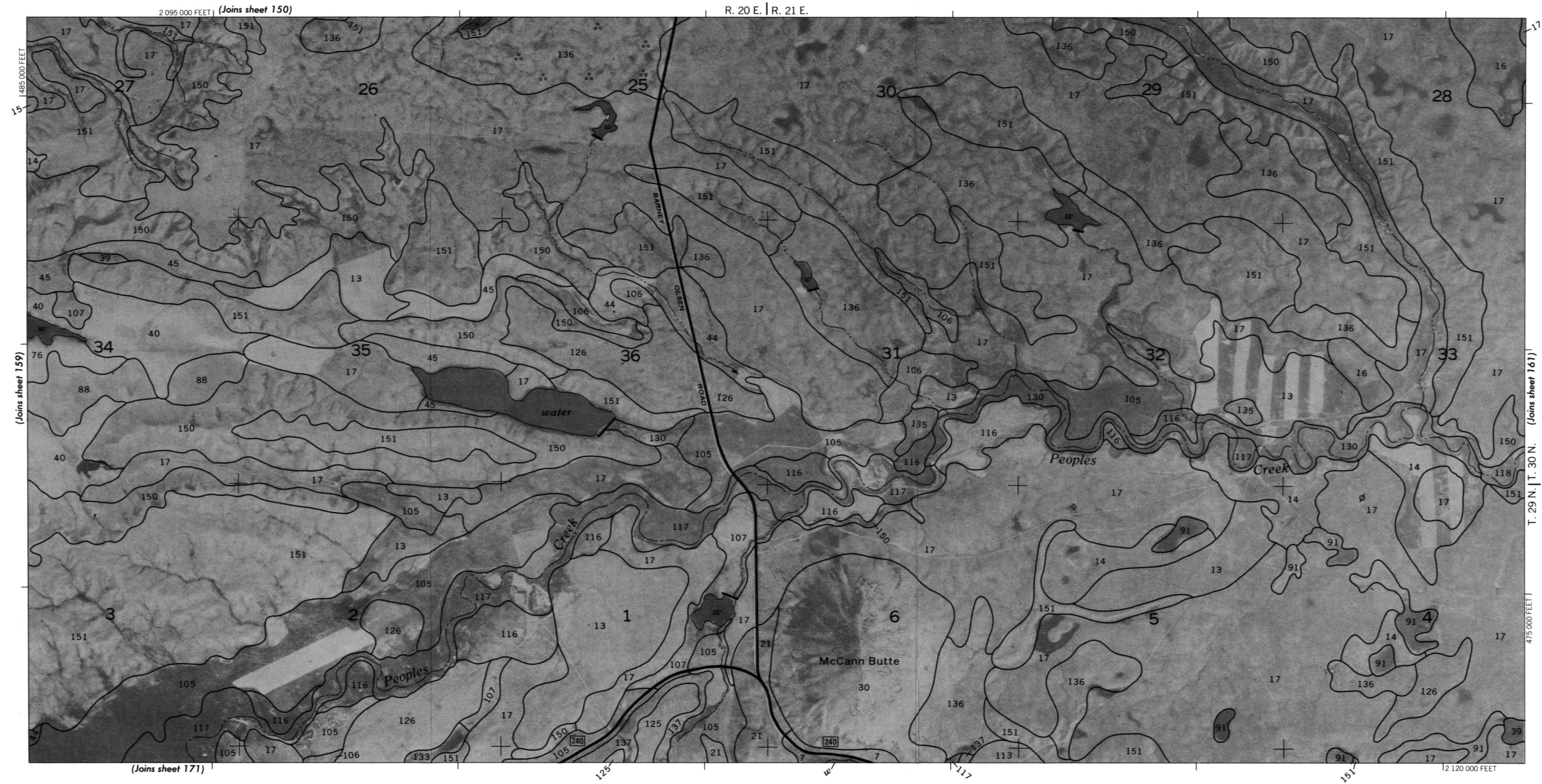


SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 159

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 159

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

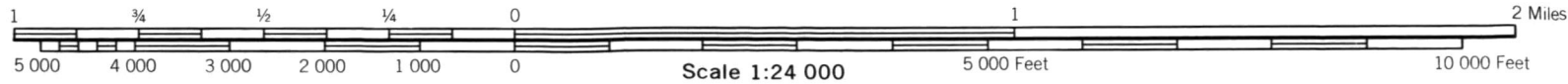
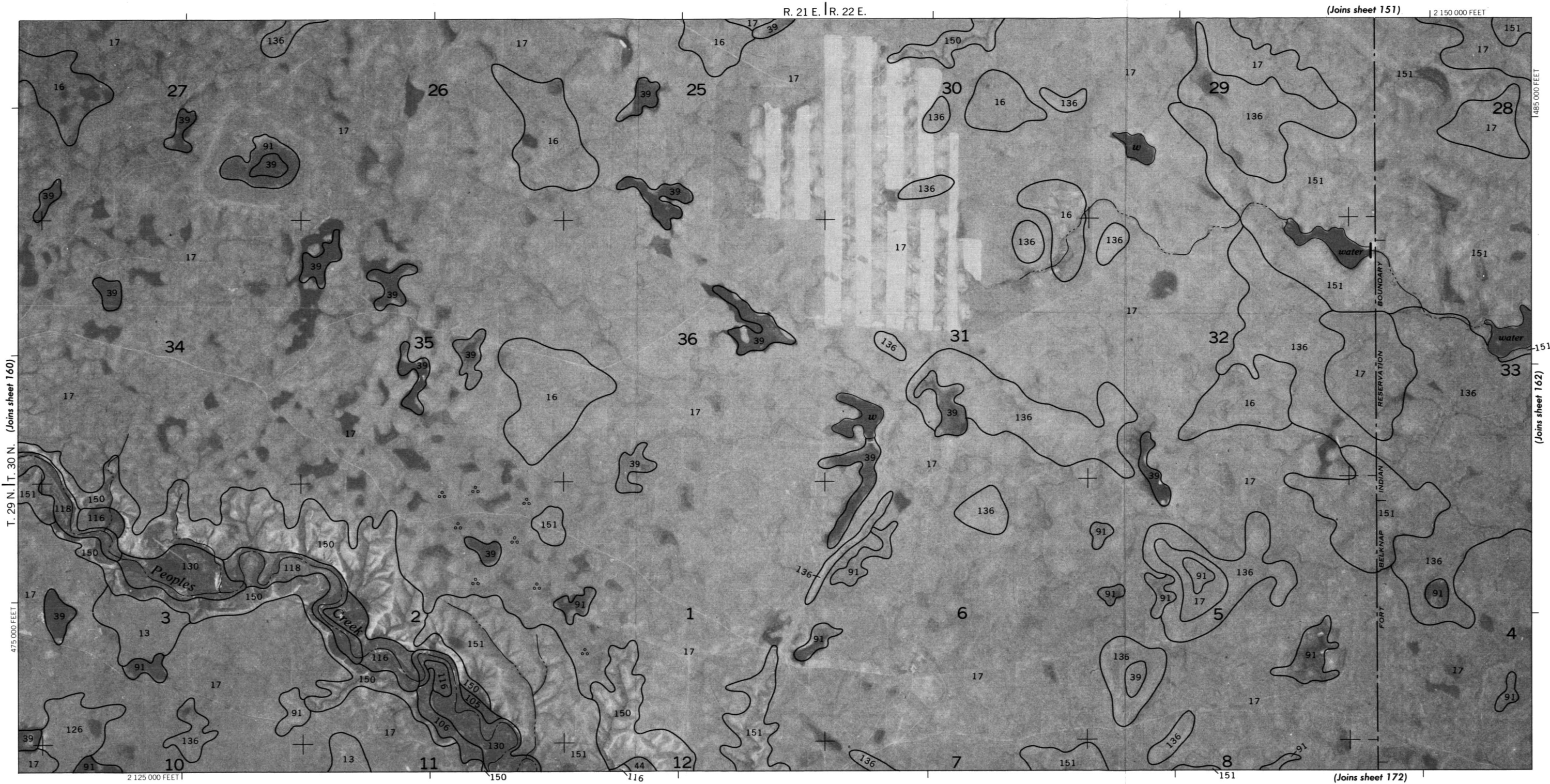


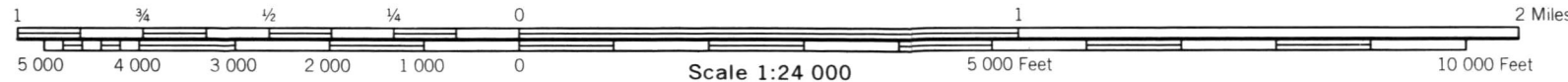
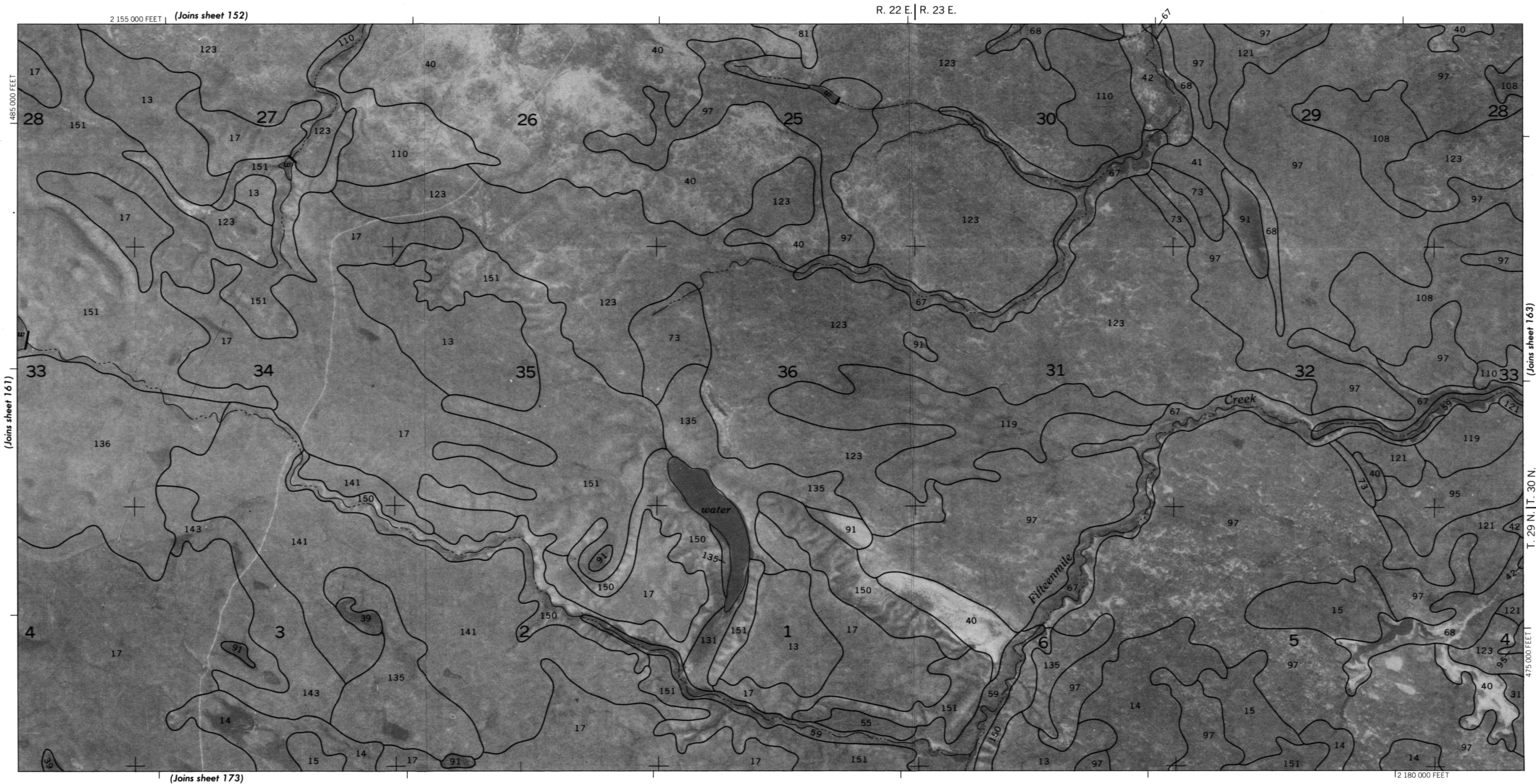


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

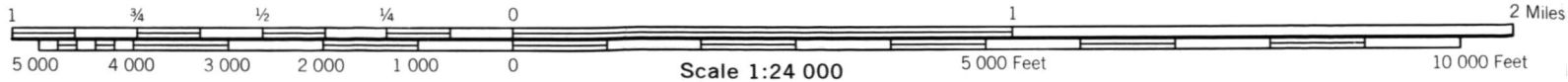
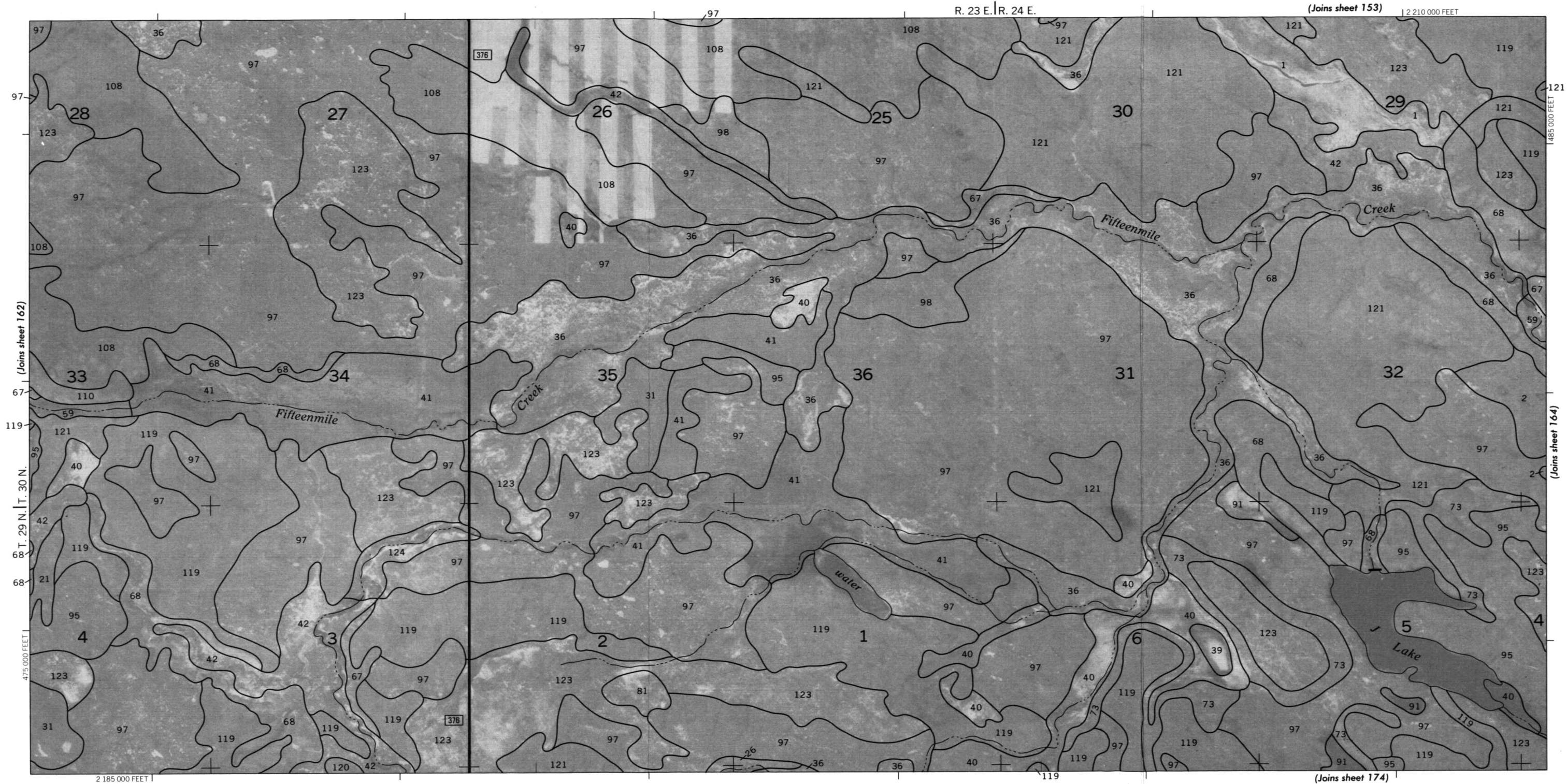
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 161

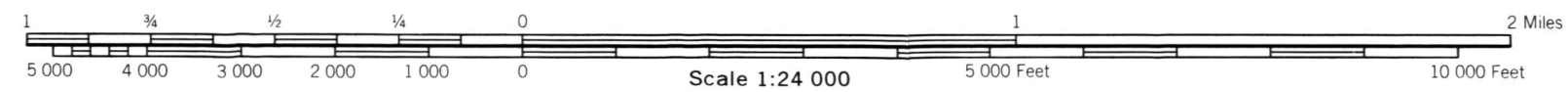
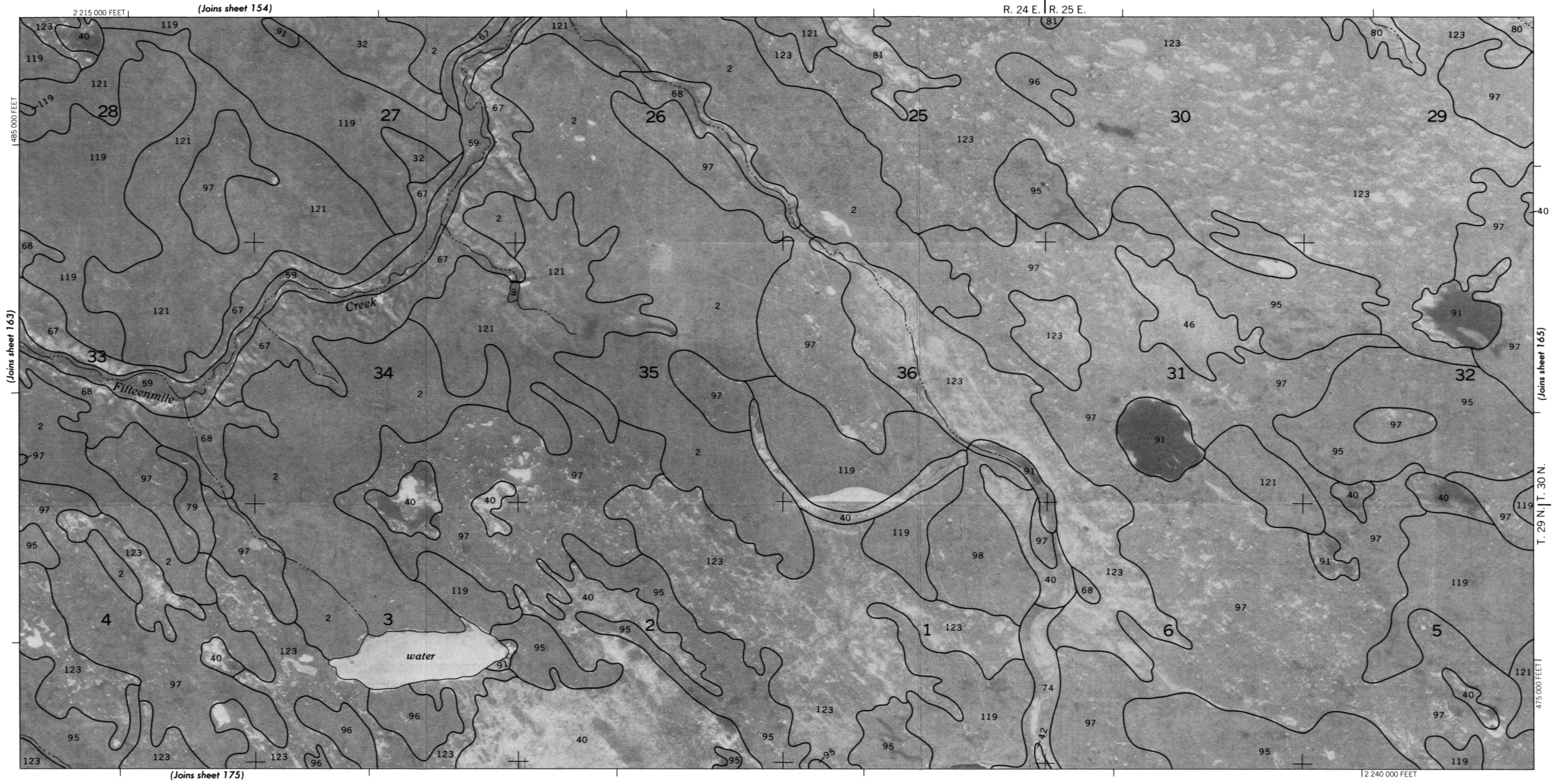




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

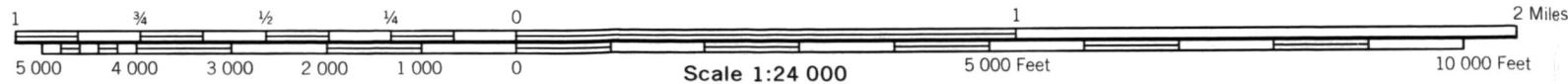
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

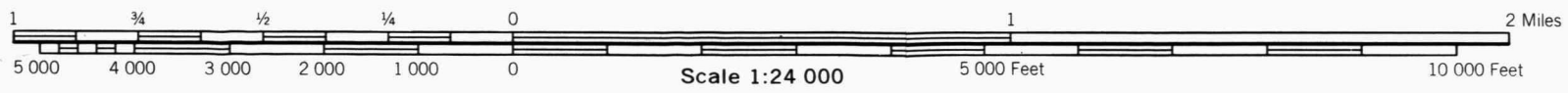
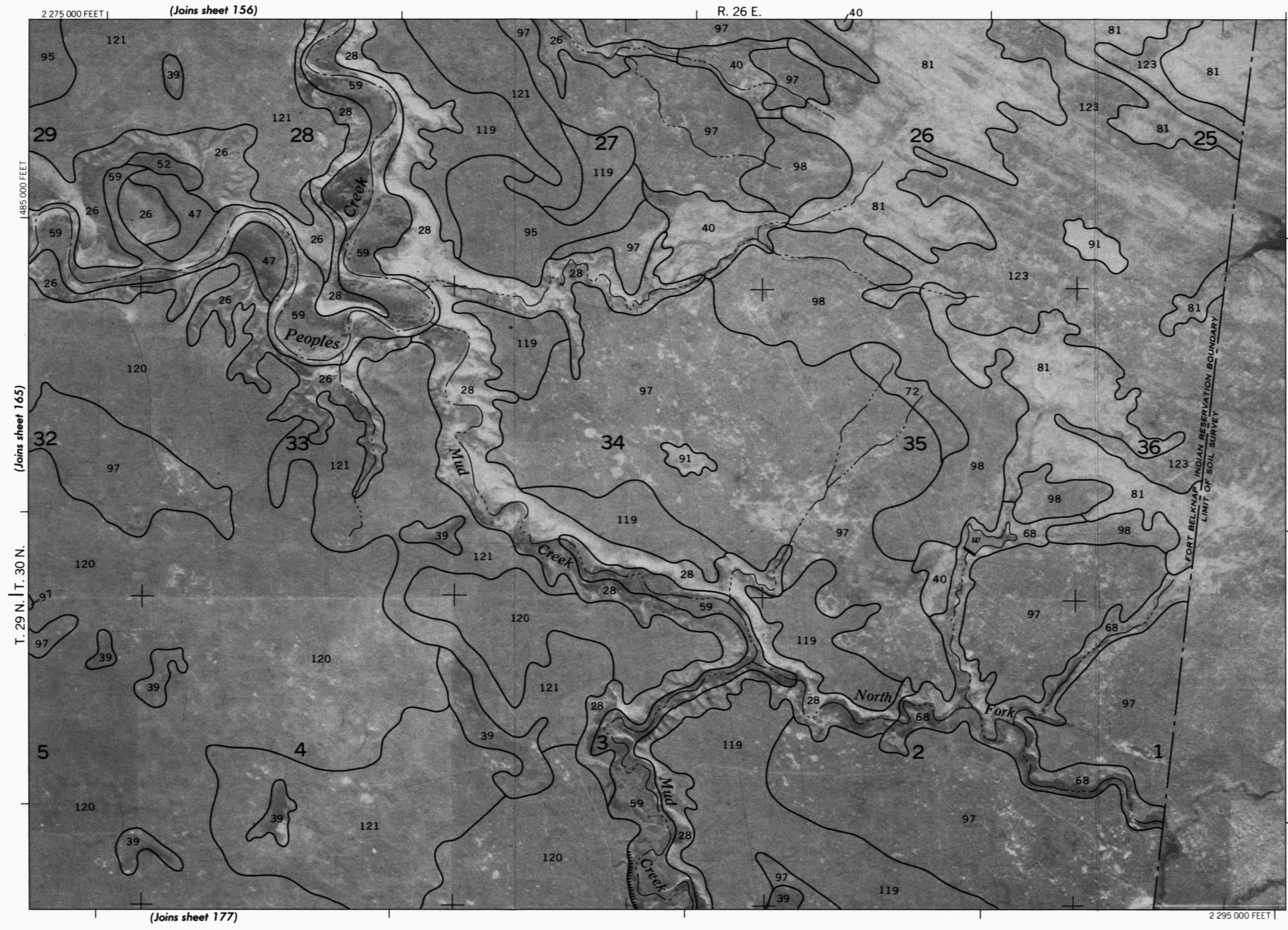




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

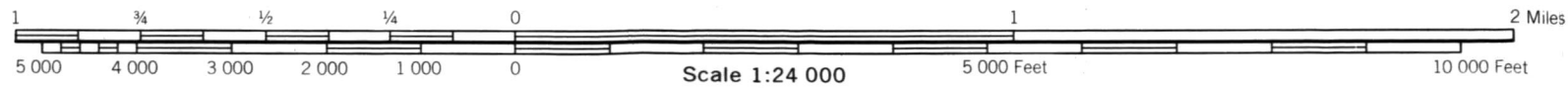
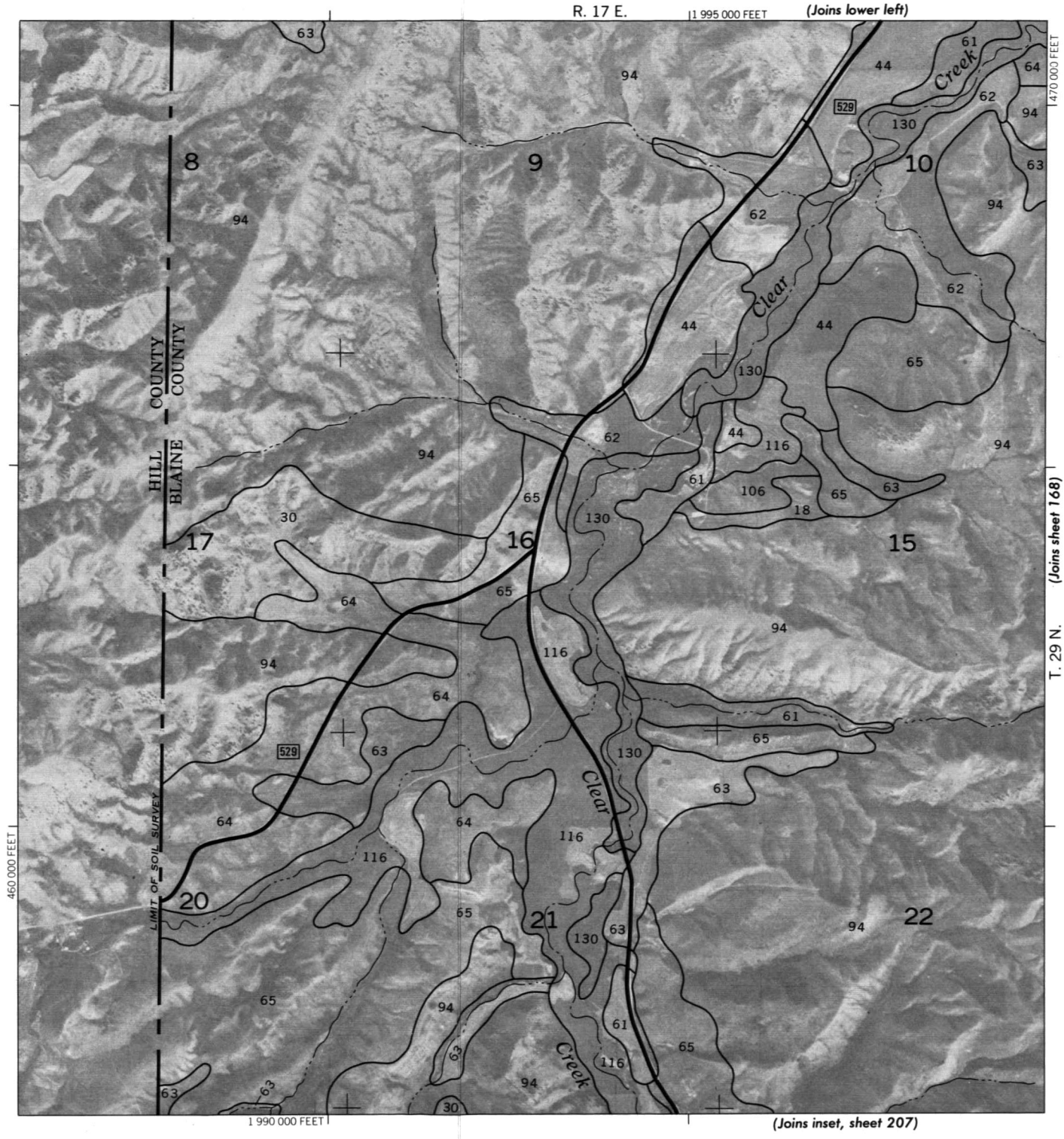
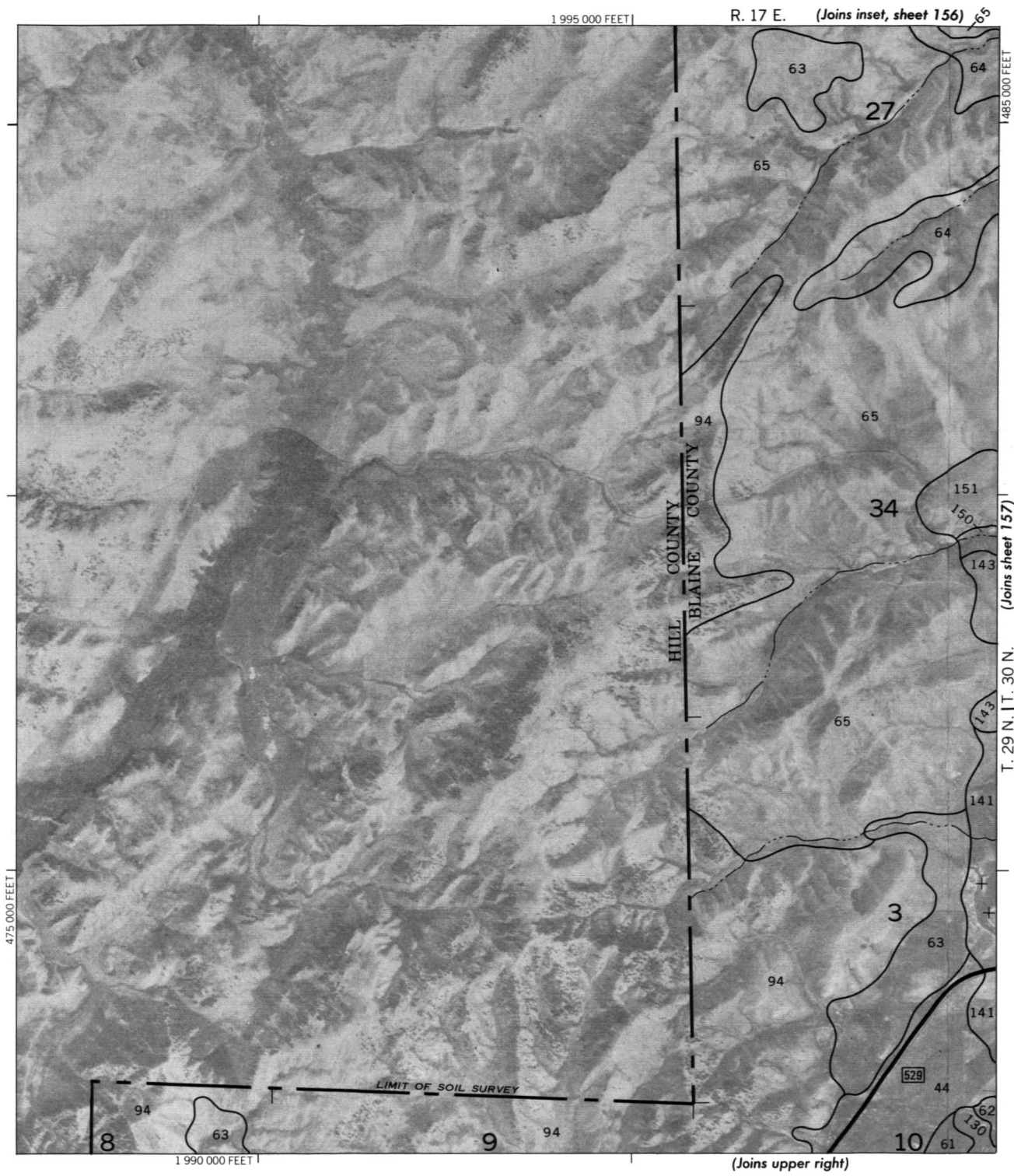


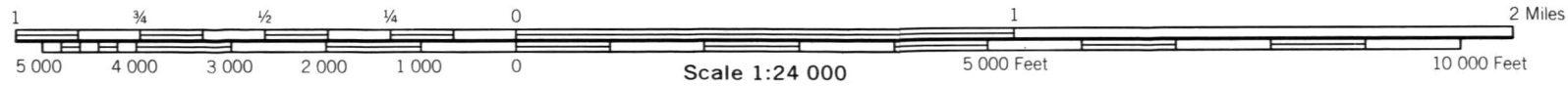
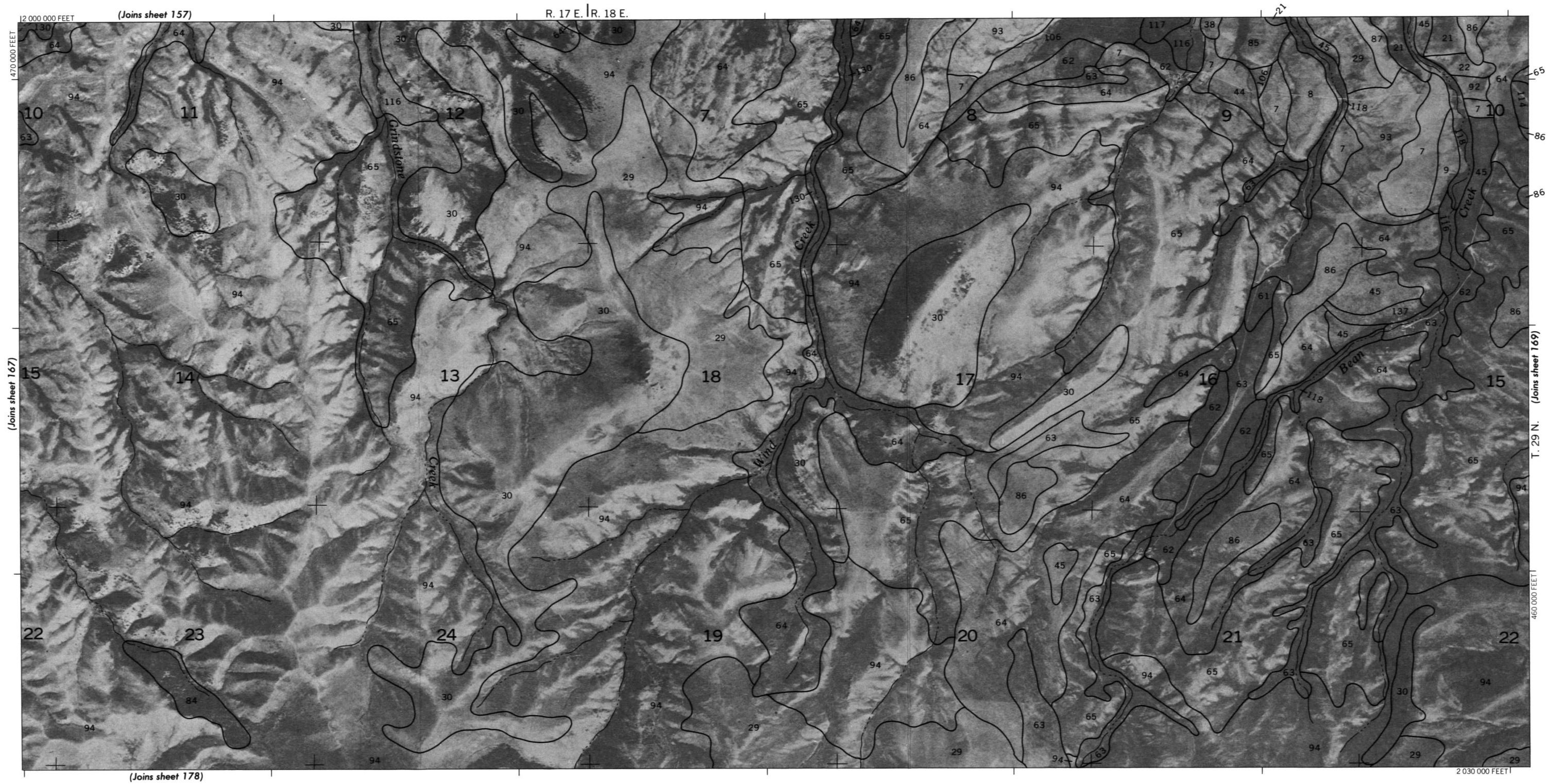


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 167

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

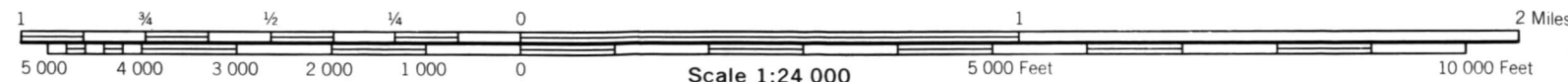
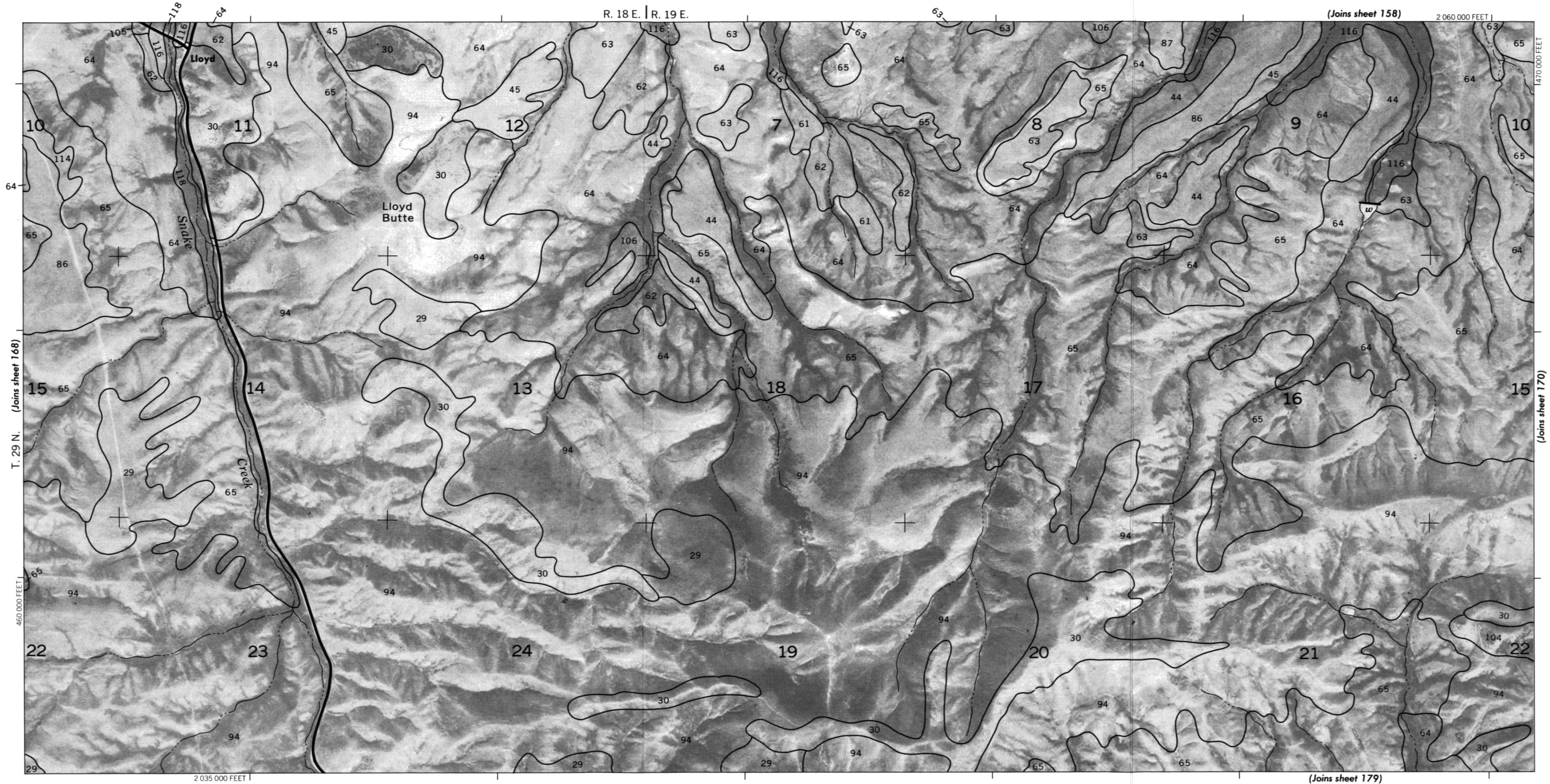


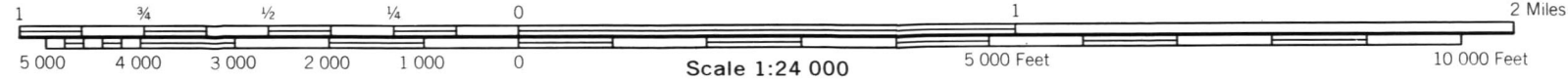
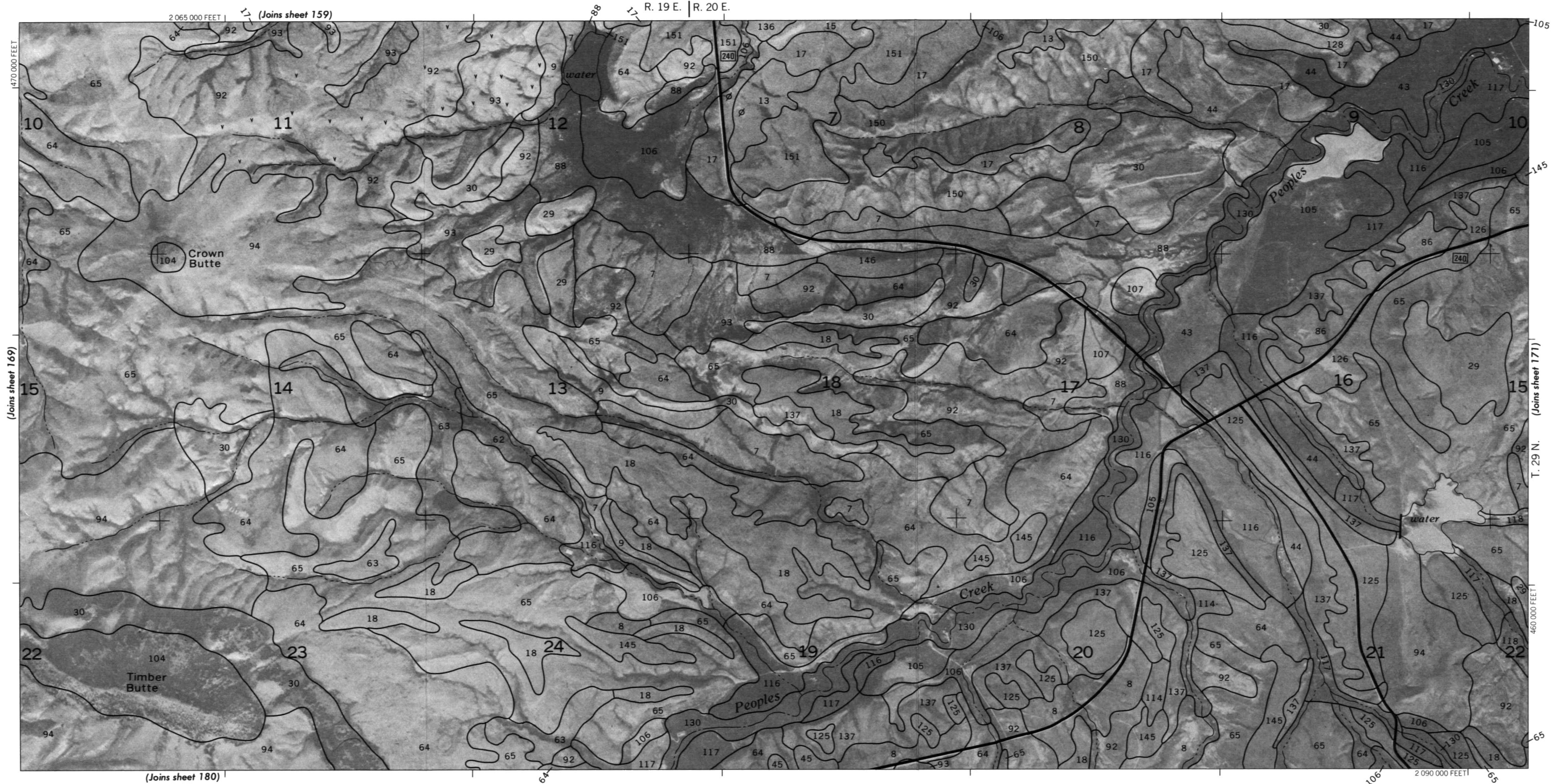


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 169

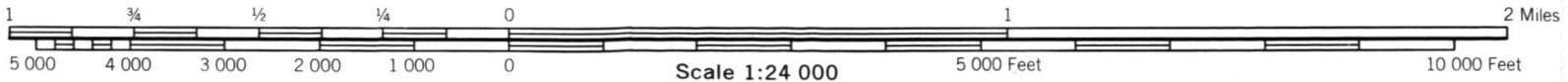
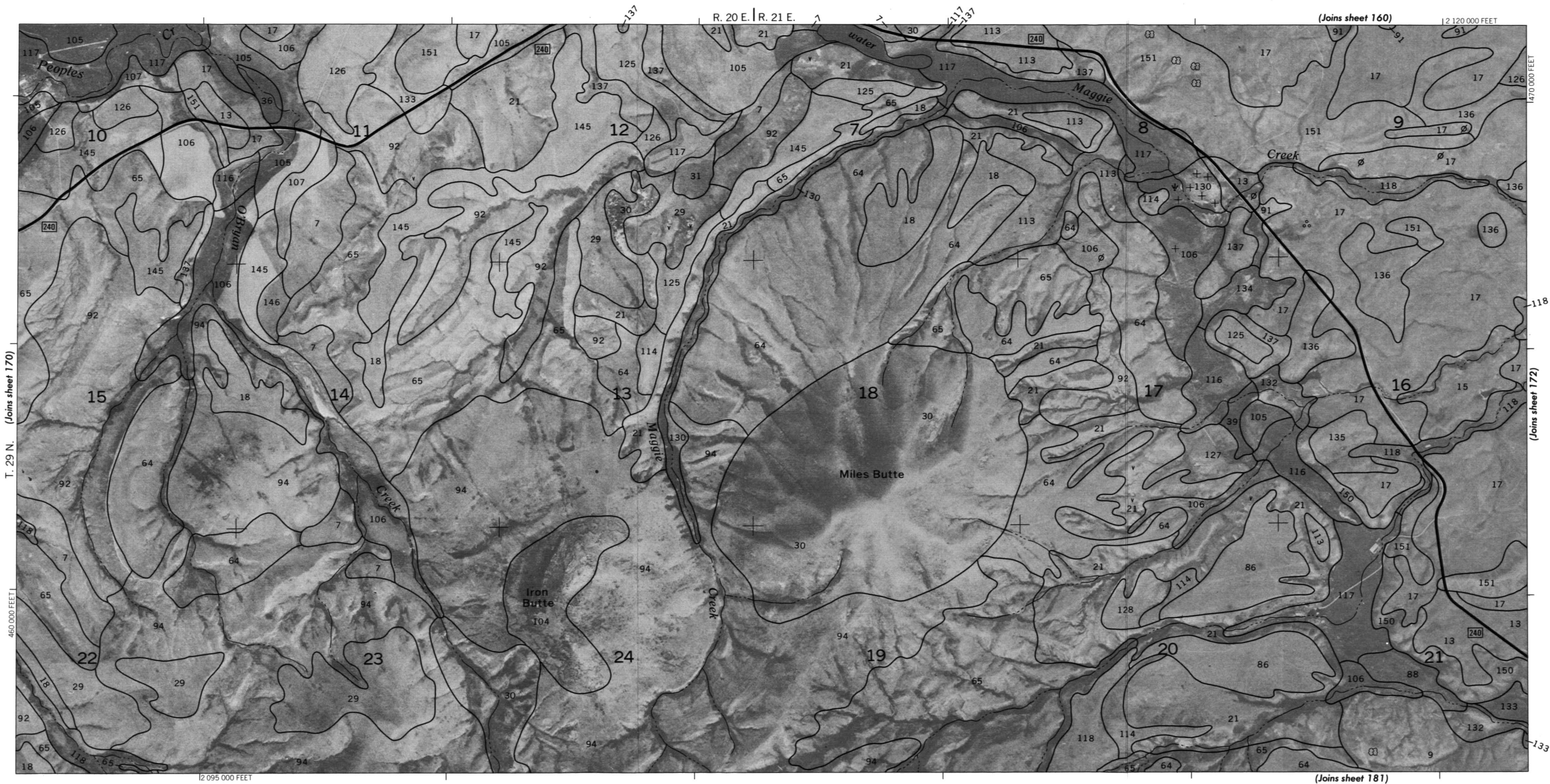


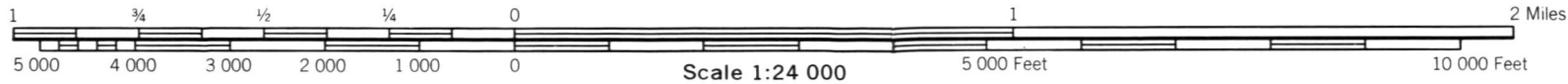
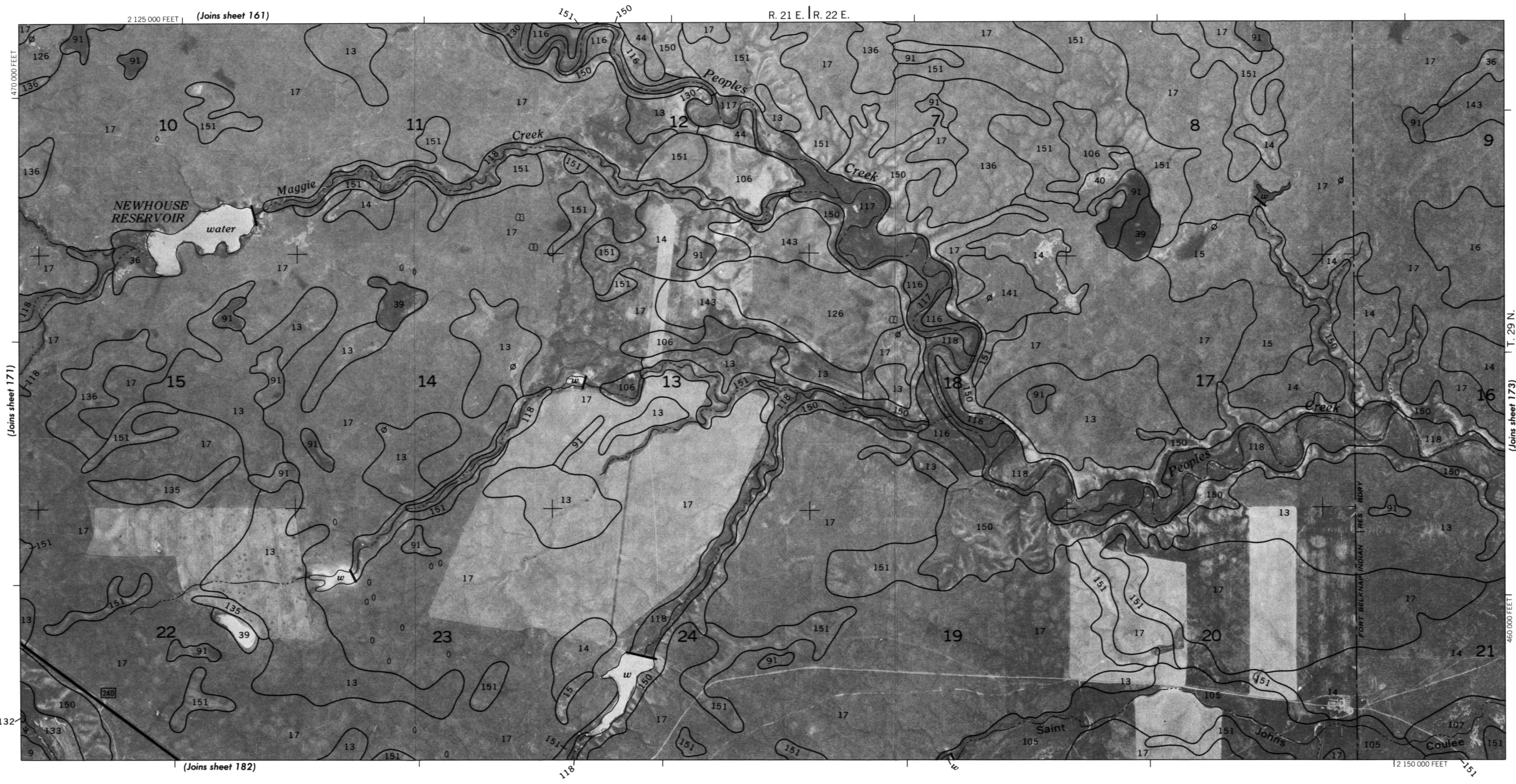


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

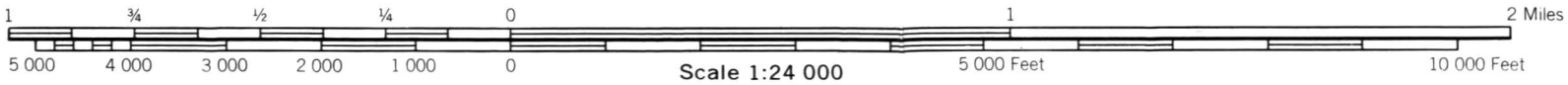
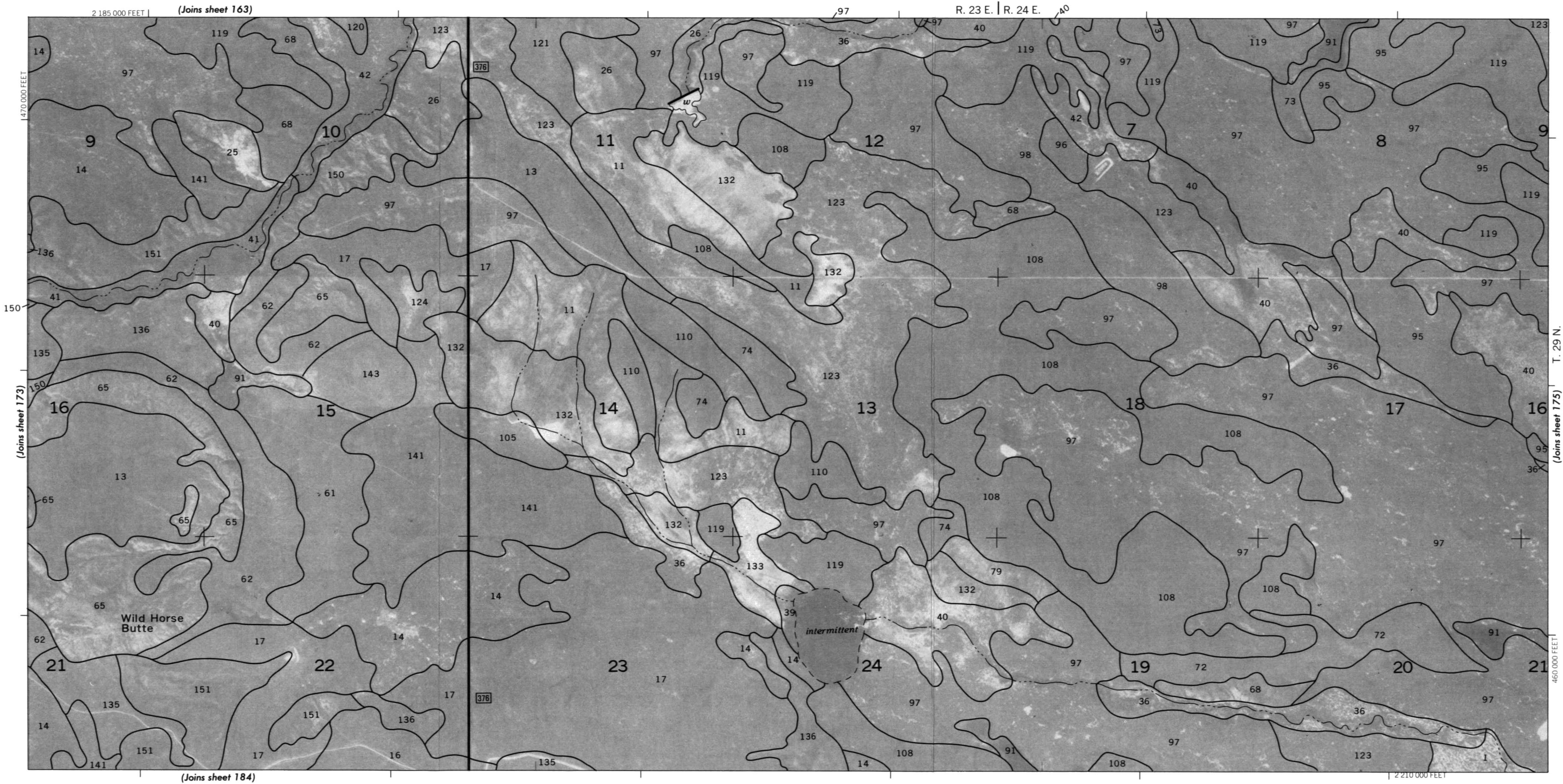
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 171

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





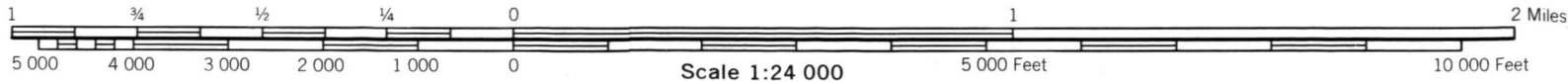
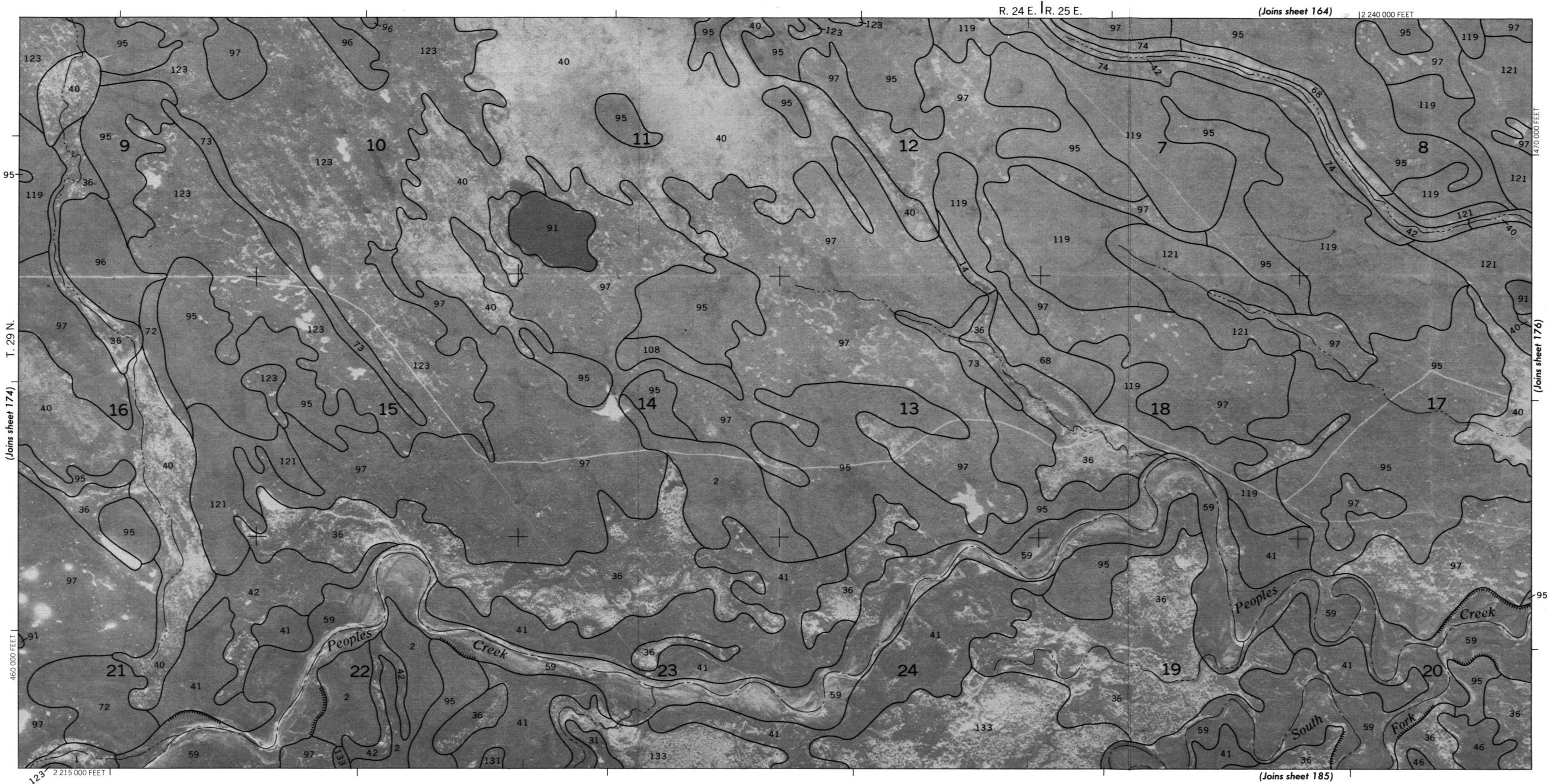
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

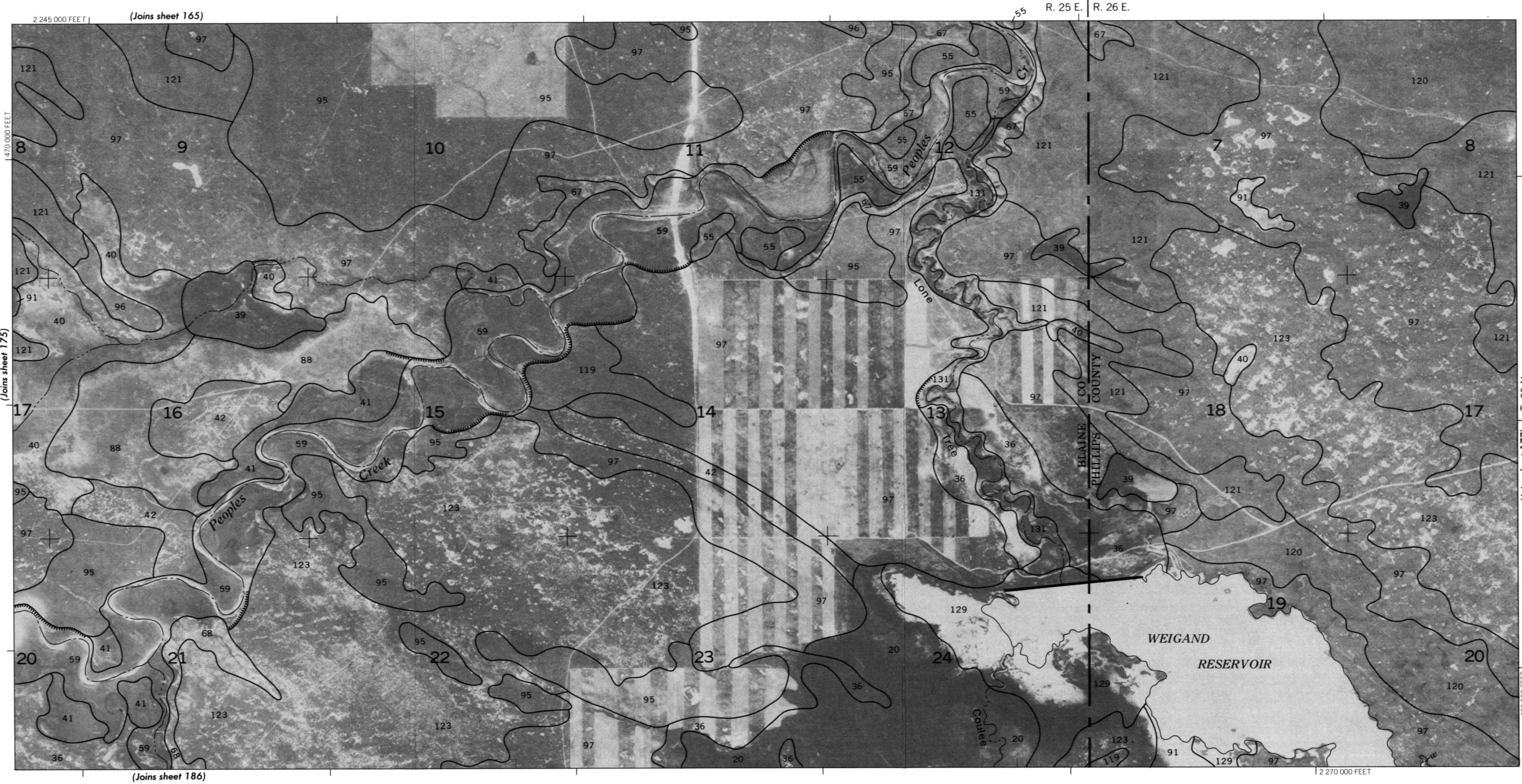


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

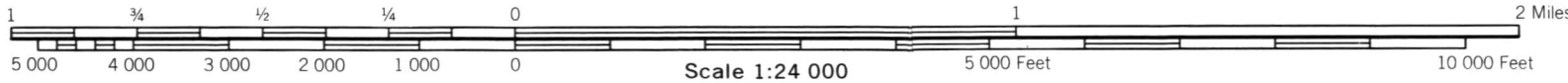
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 175

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

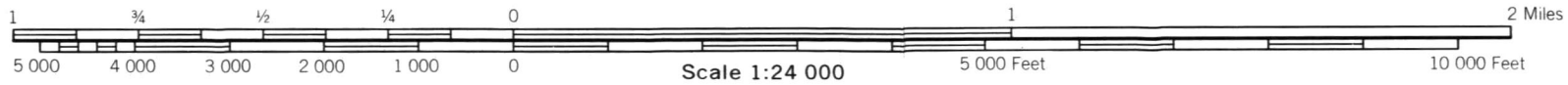
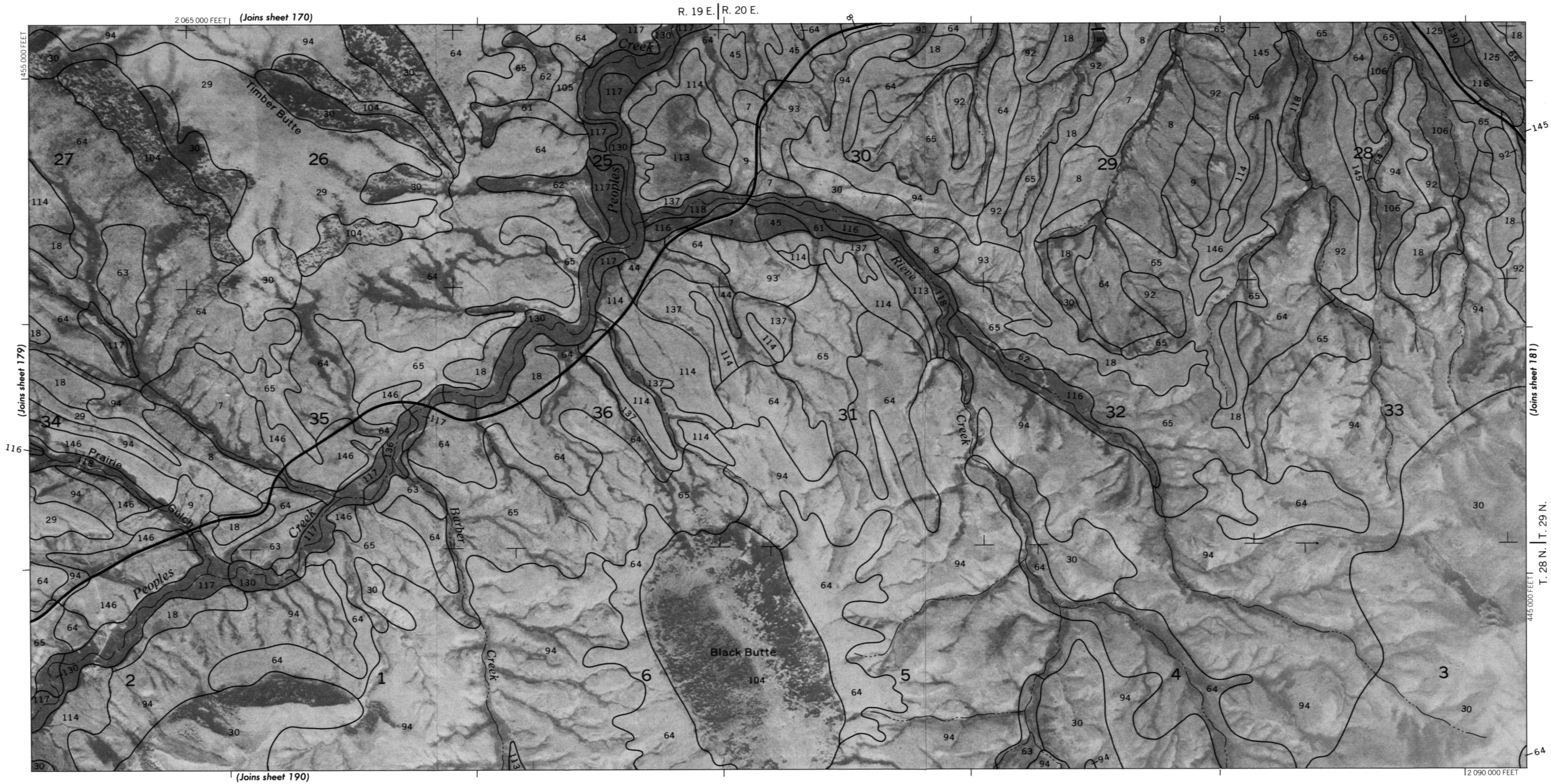


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 179

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

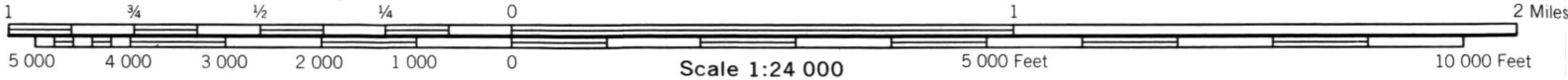


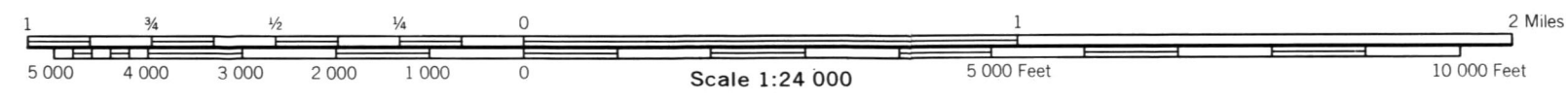
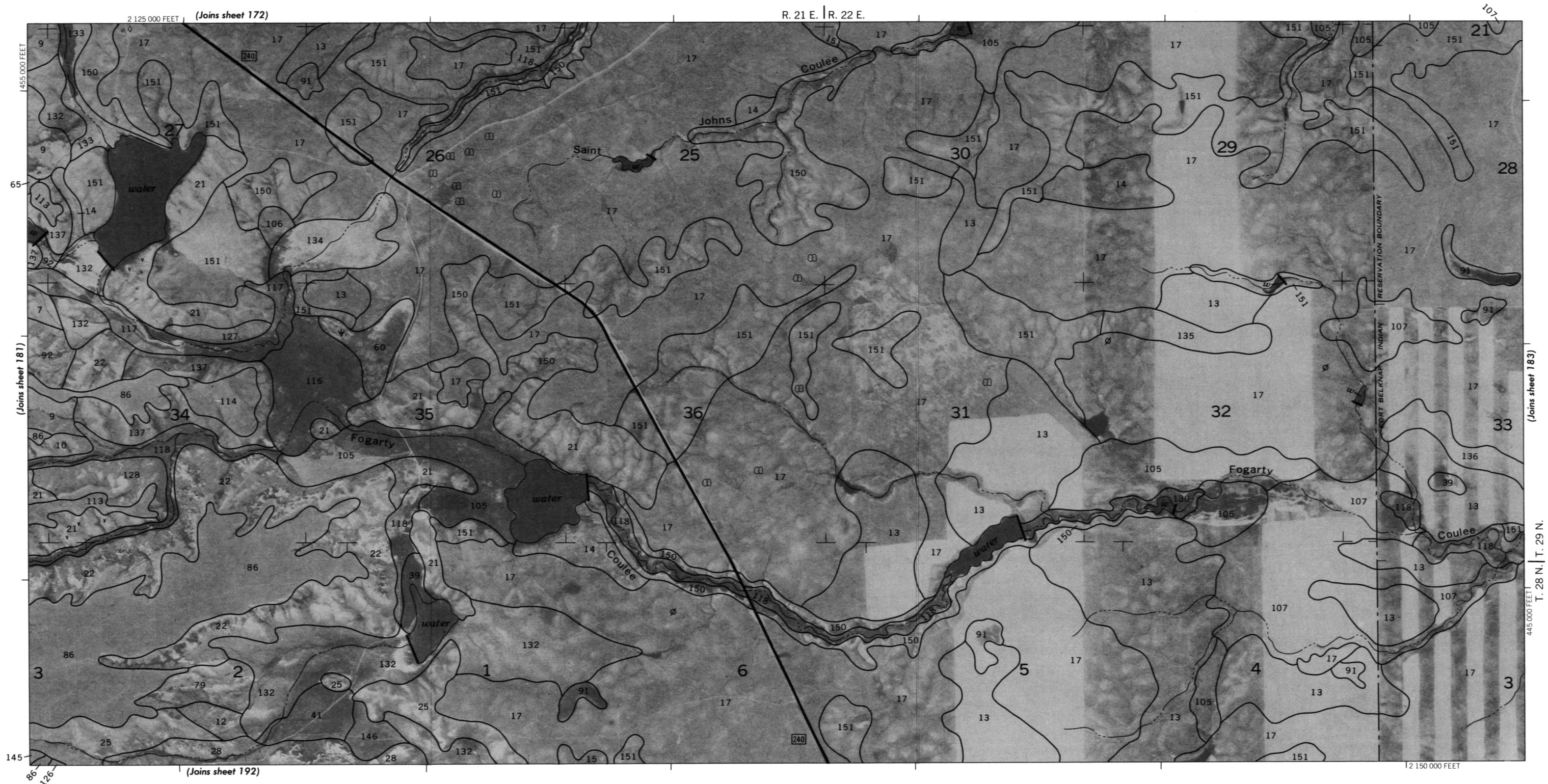


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 181

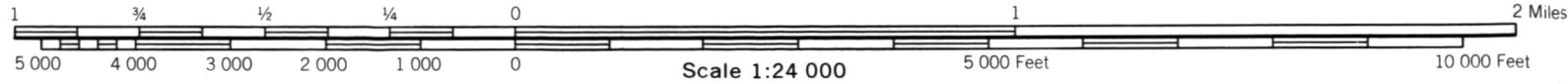
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

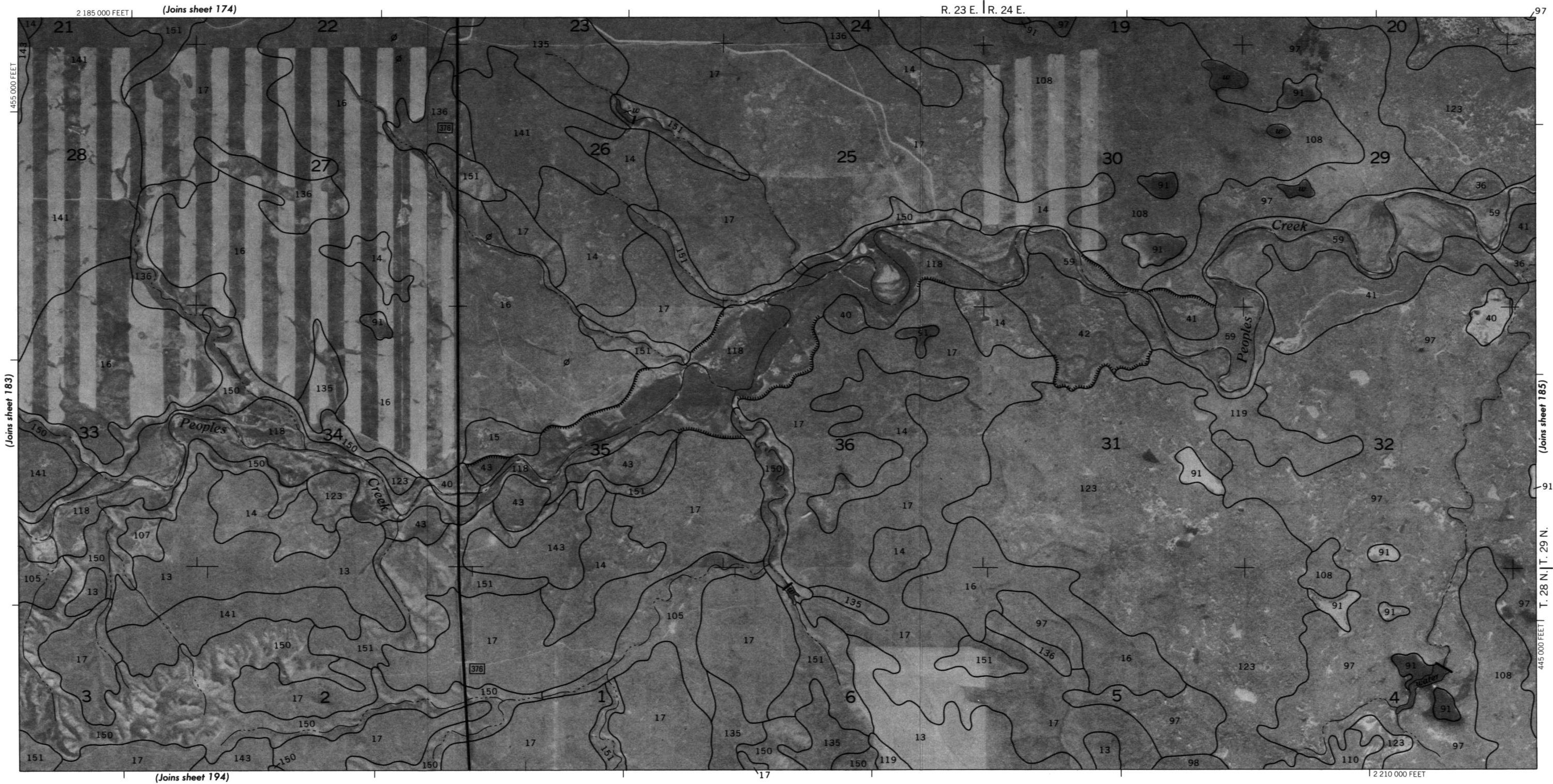




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

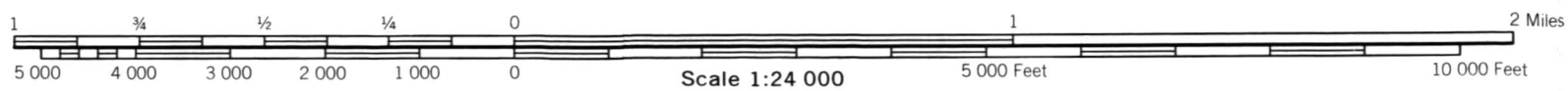
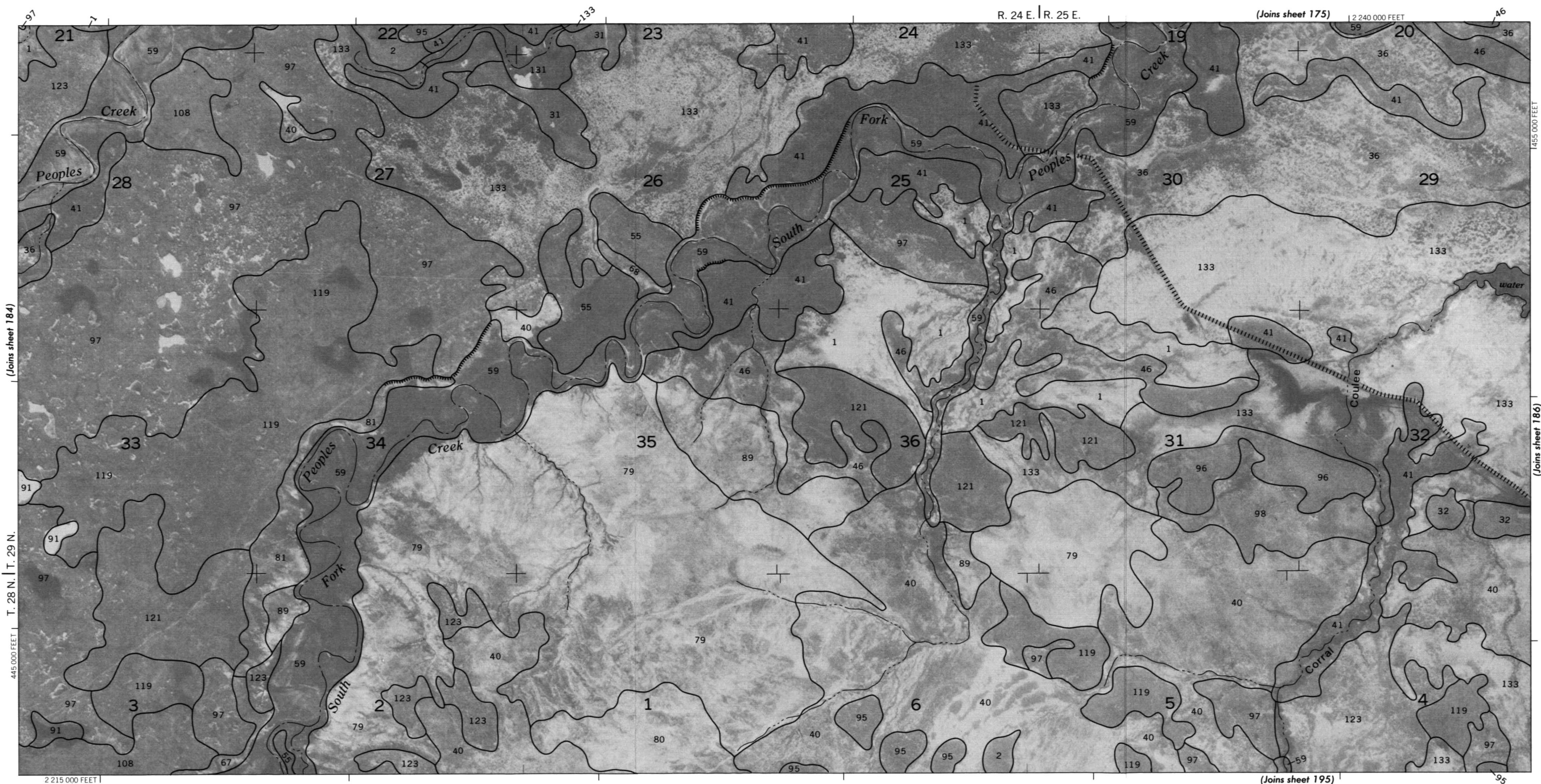




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

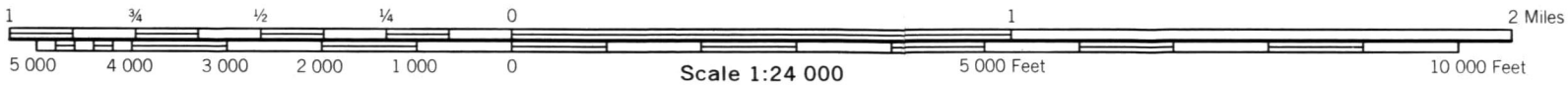
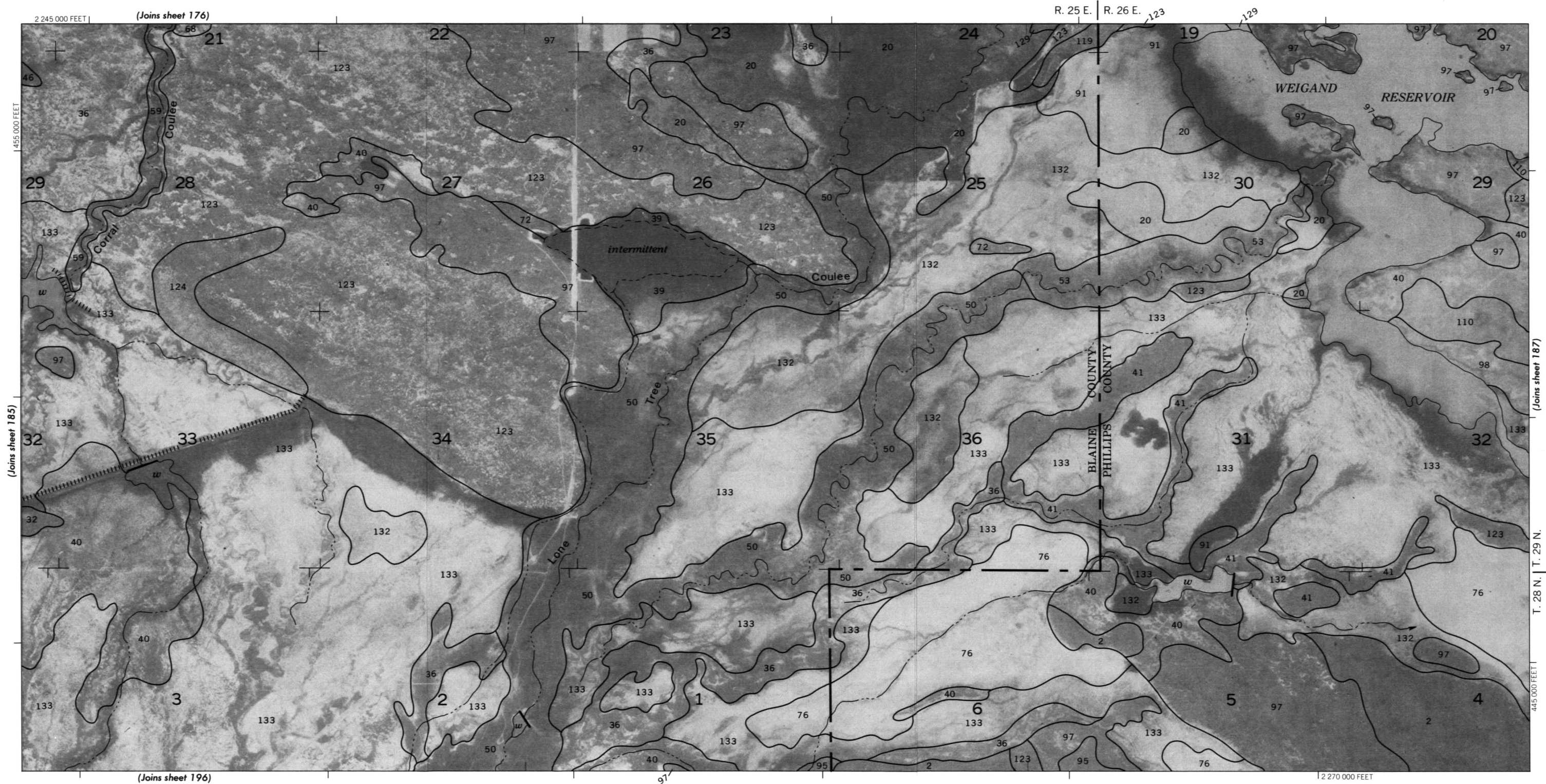
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 185

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 186

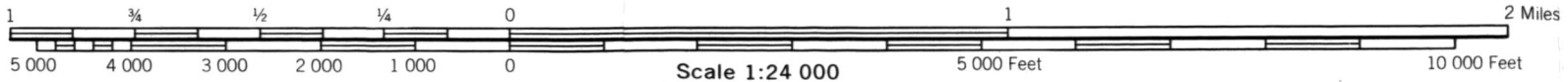
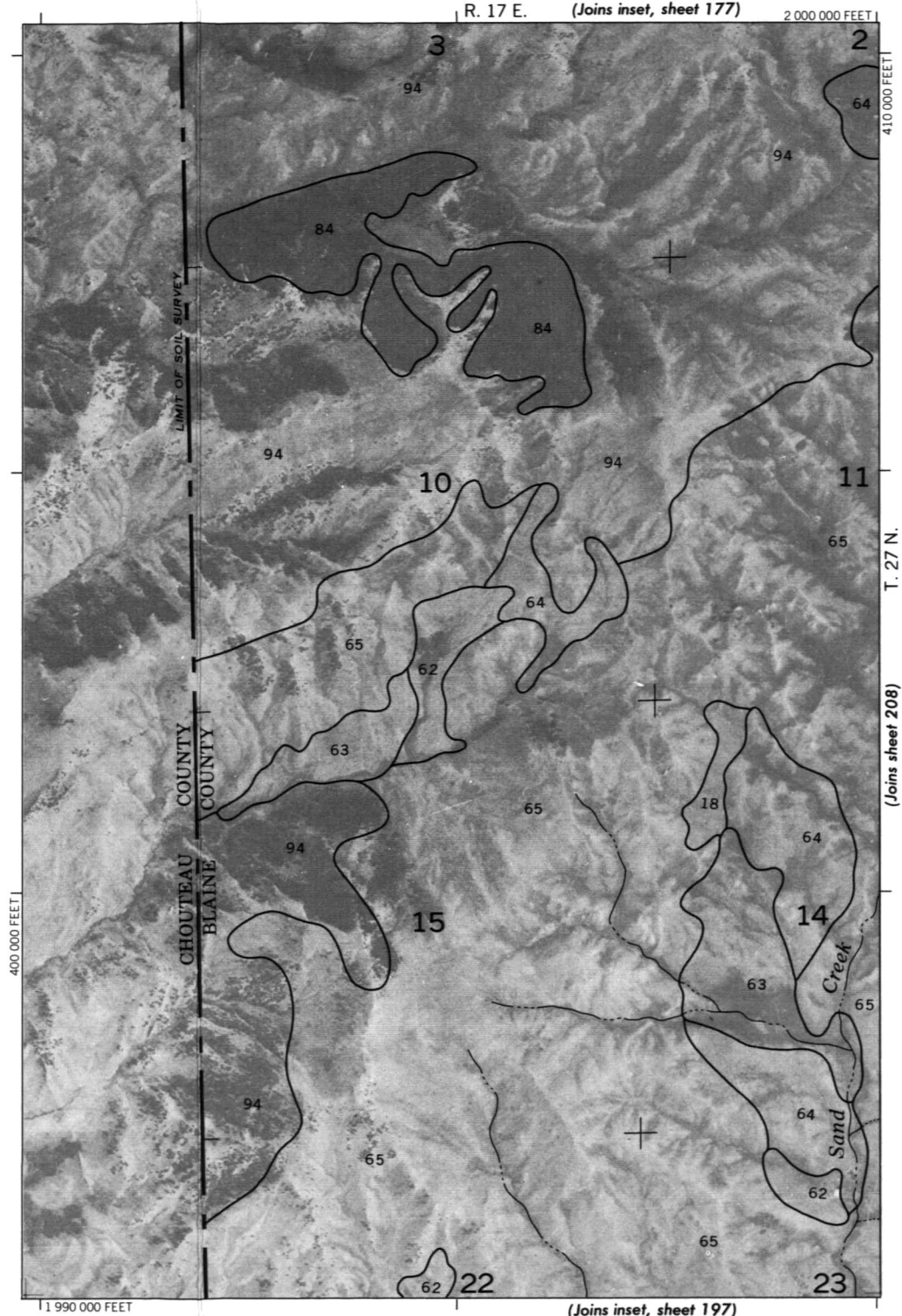
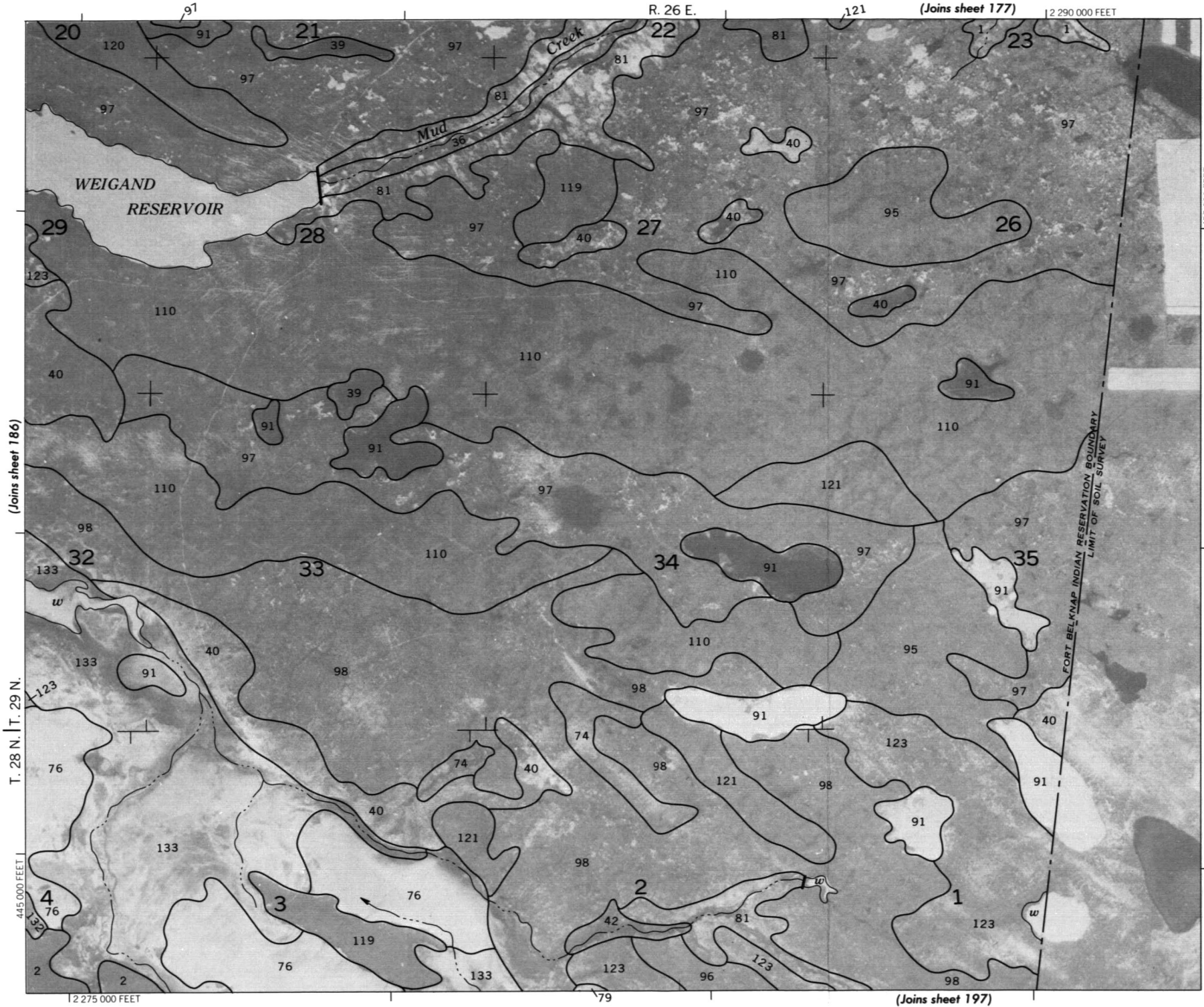


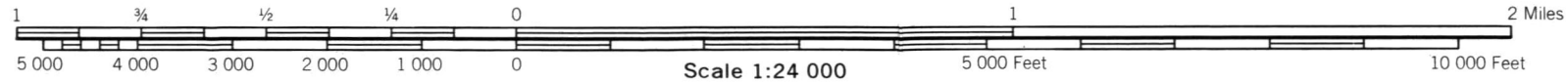
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 187

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





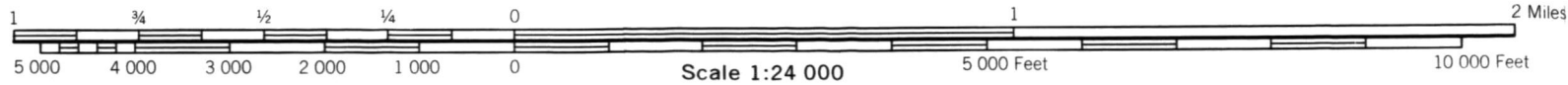
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

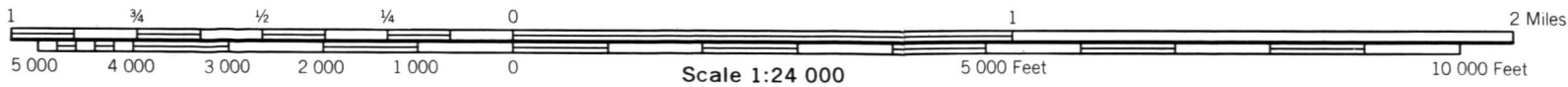
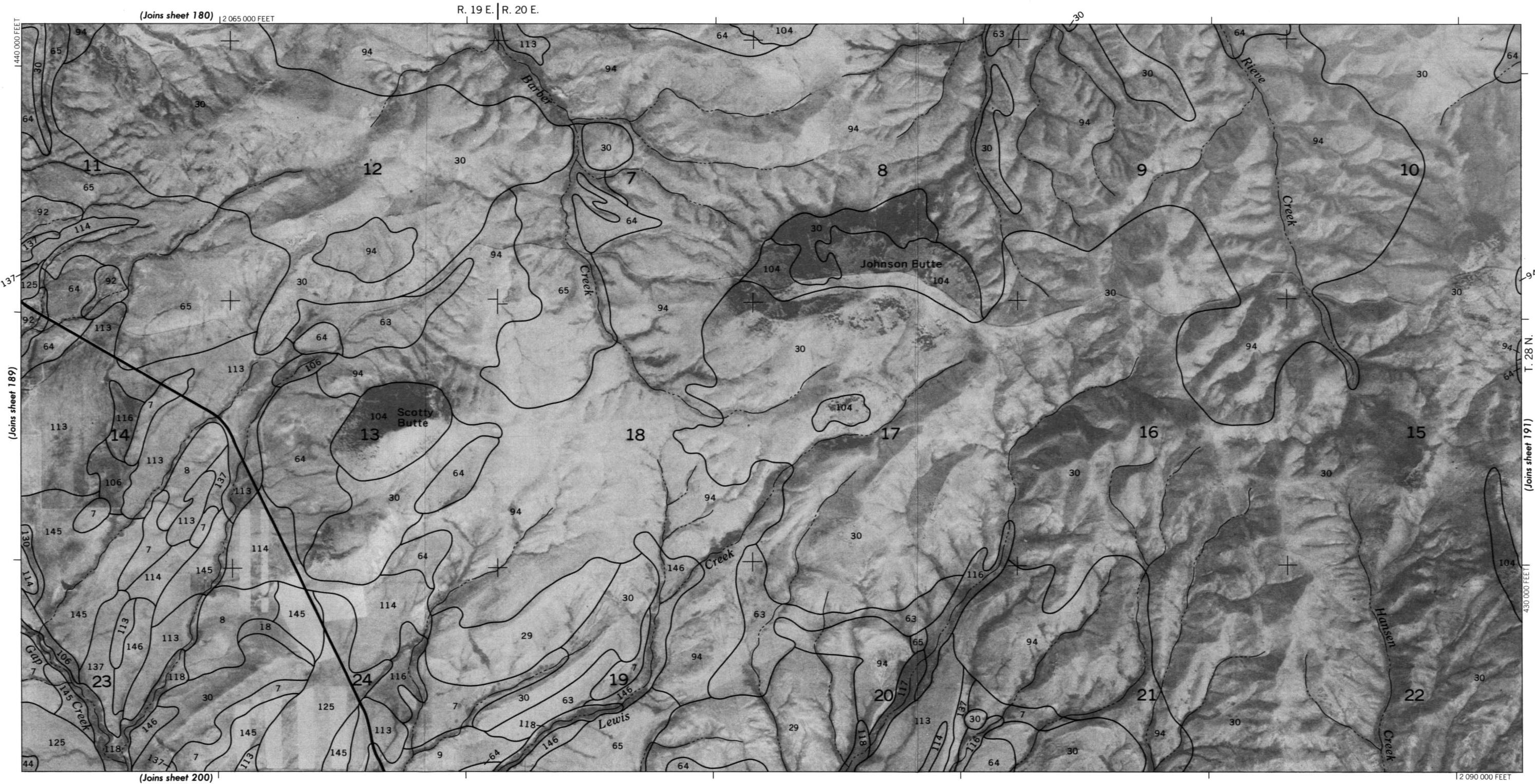


SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 189

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 189

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

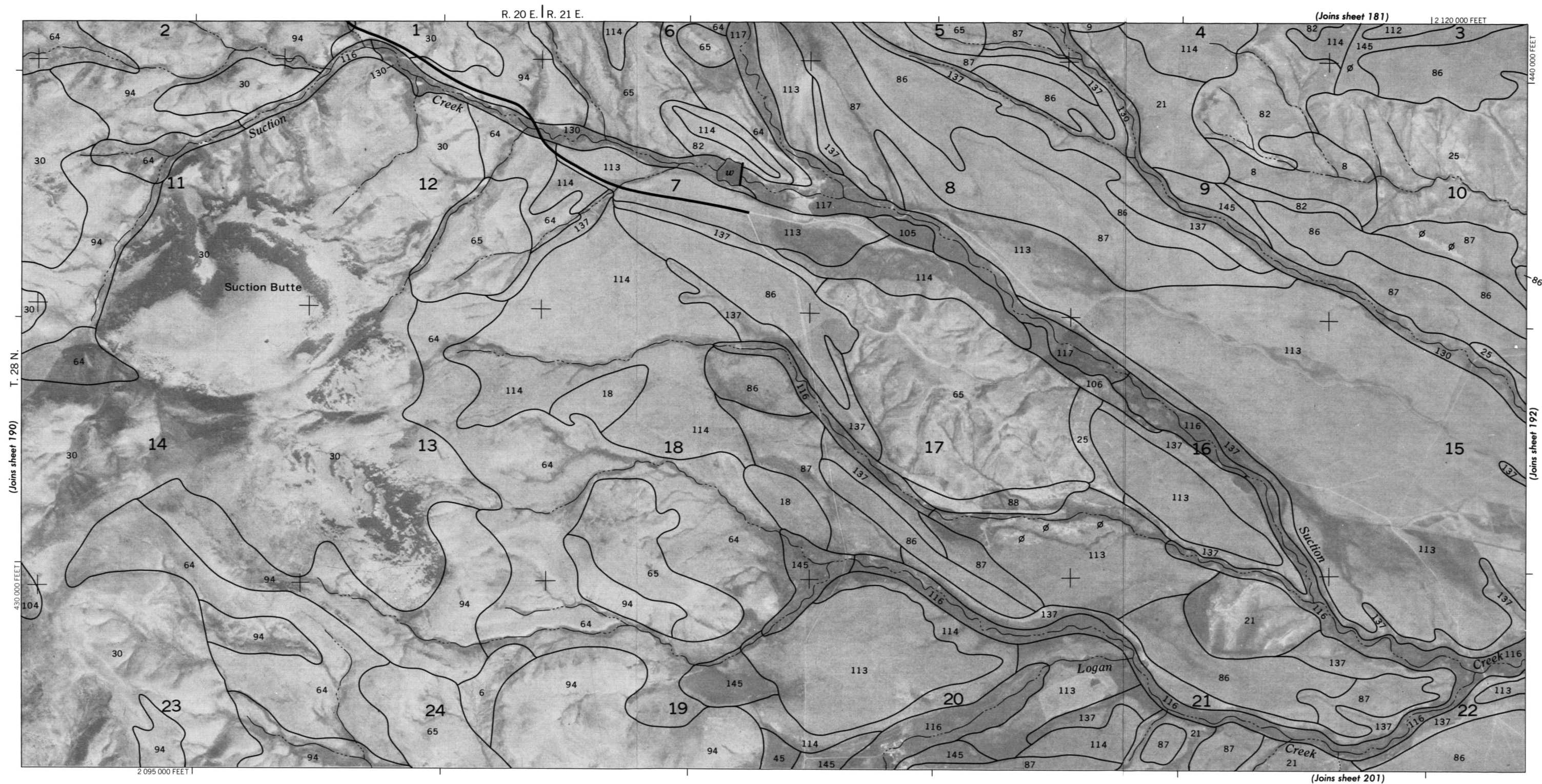


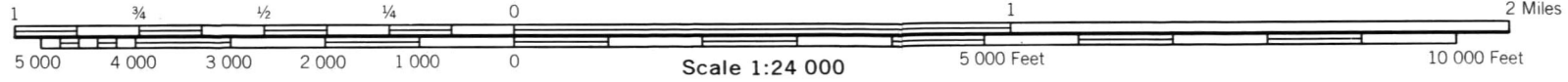
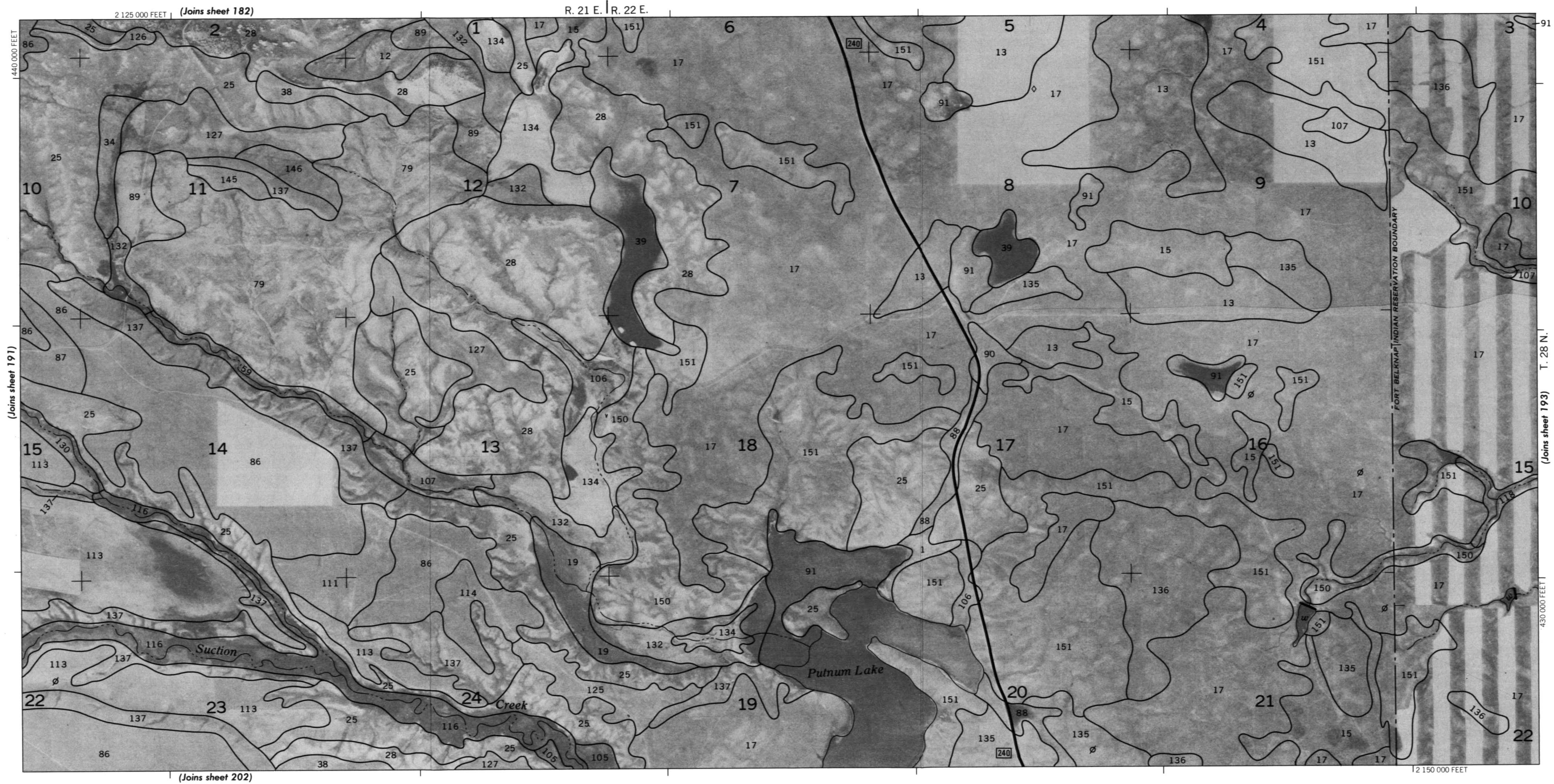


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

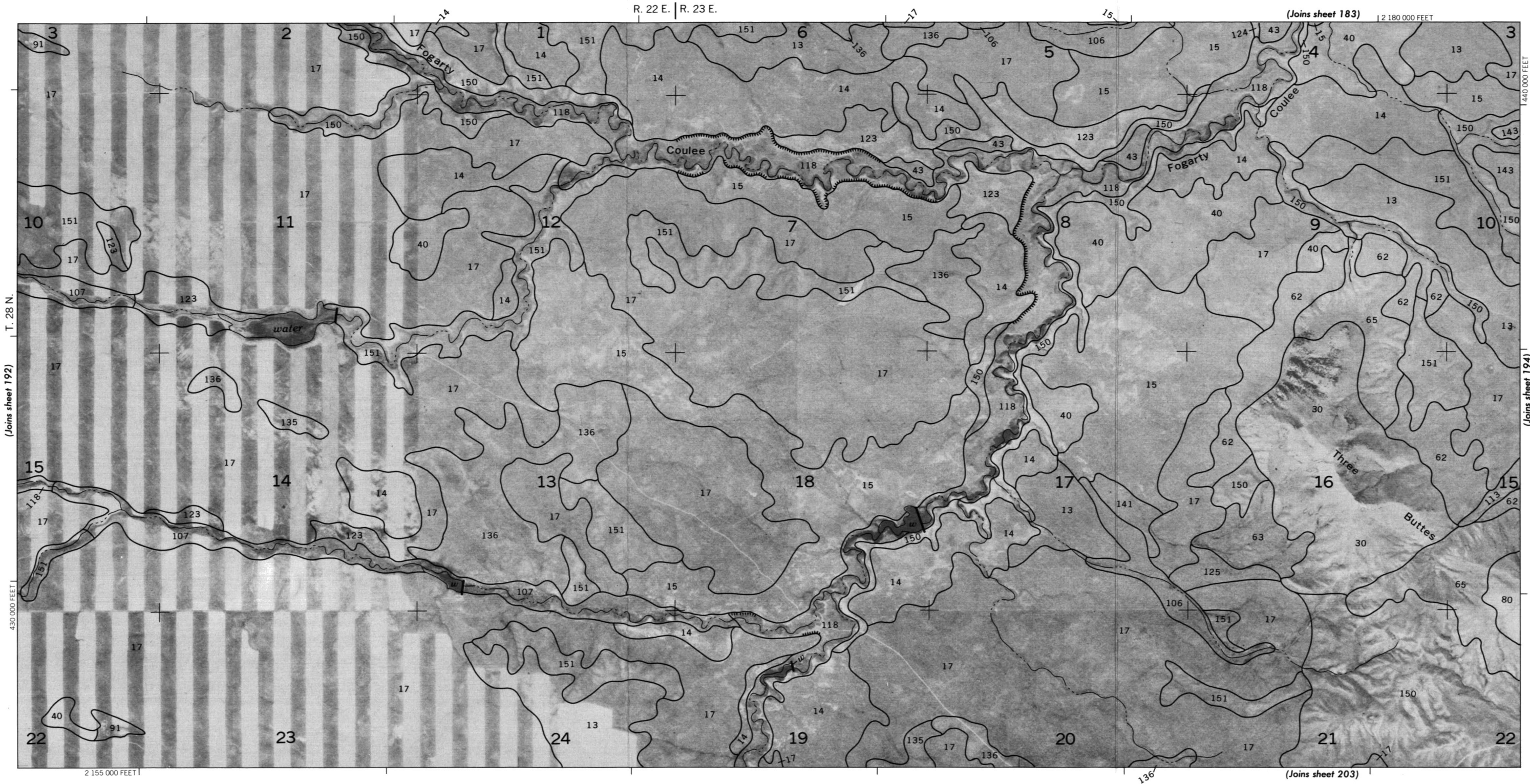
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 191

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



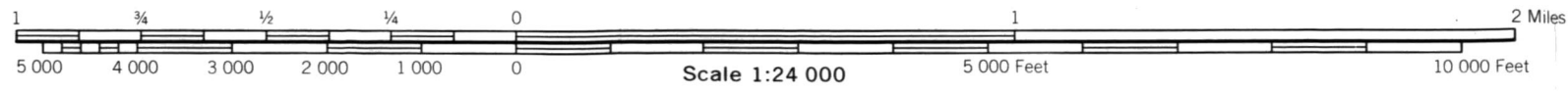


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 193

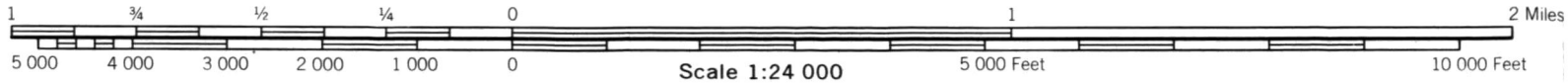
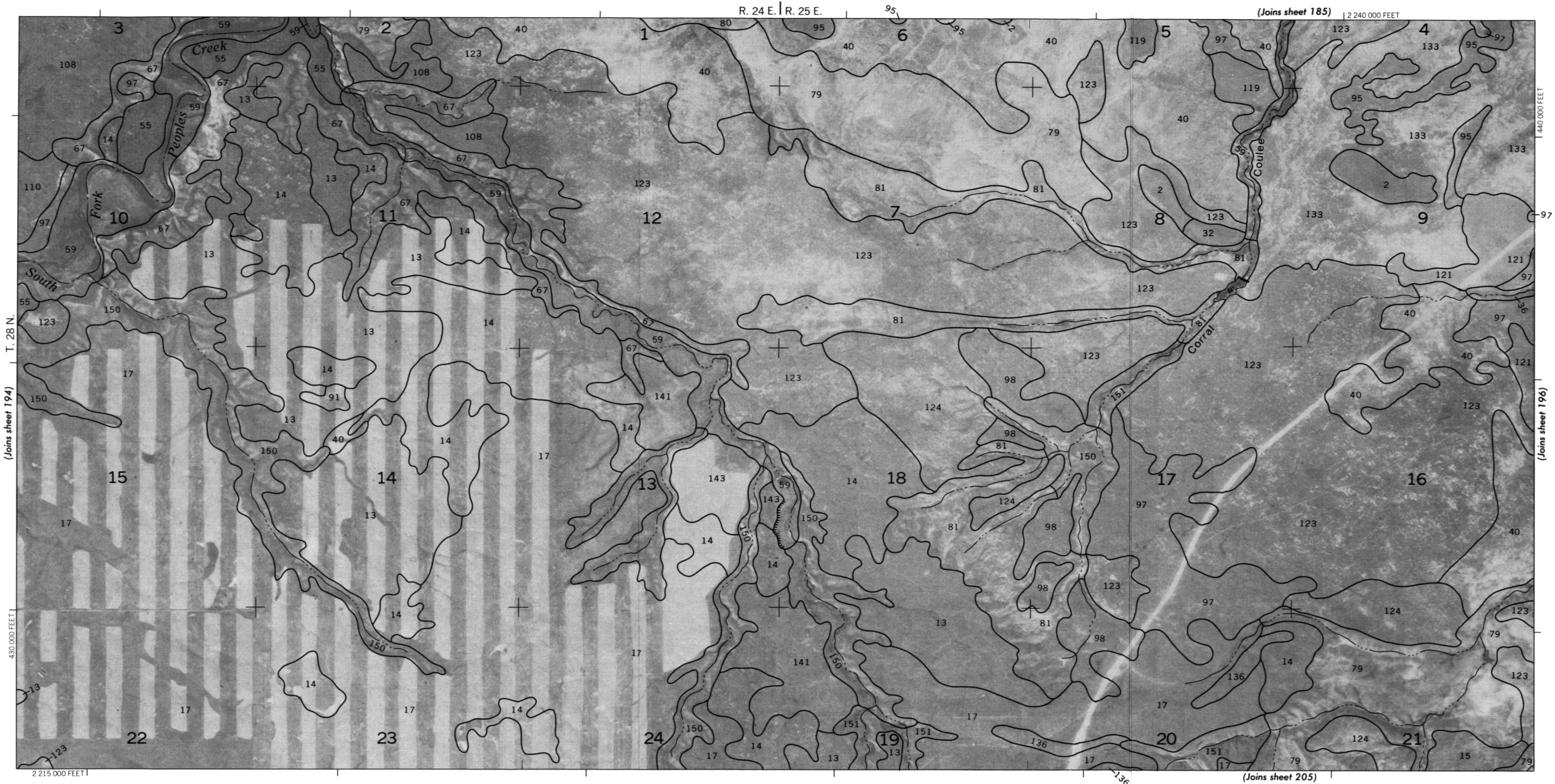
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

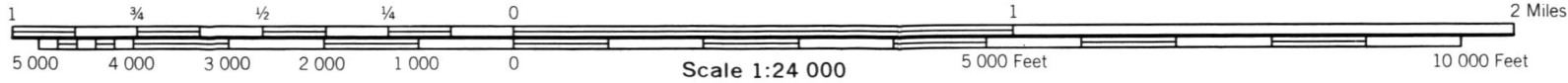
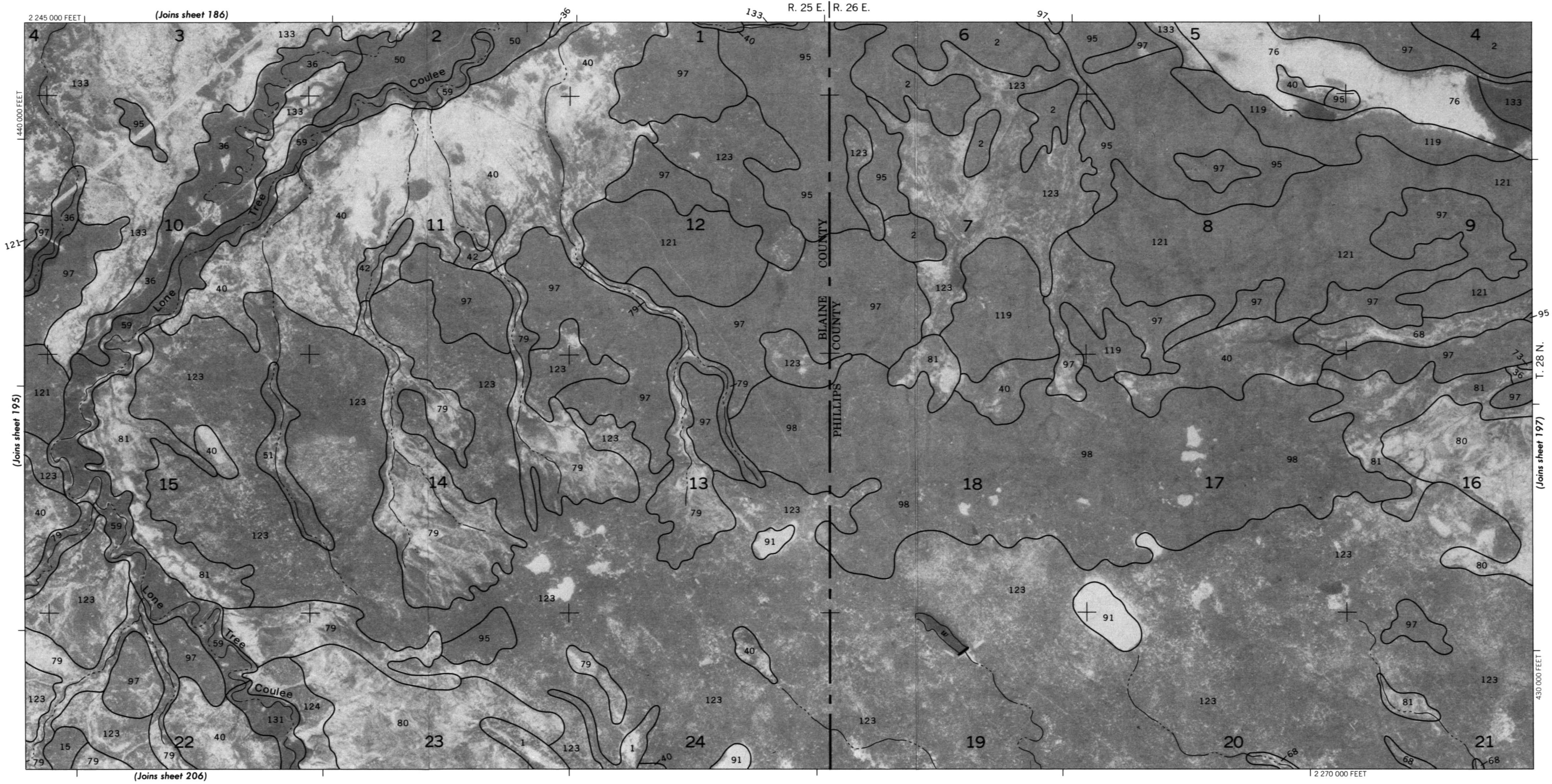


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 194

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 195

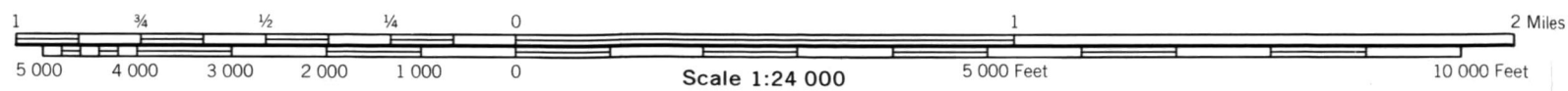
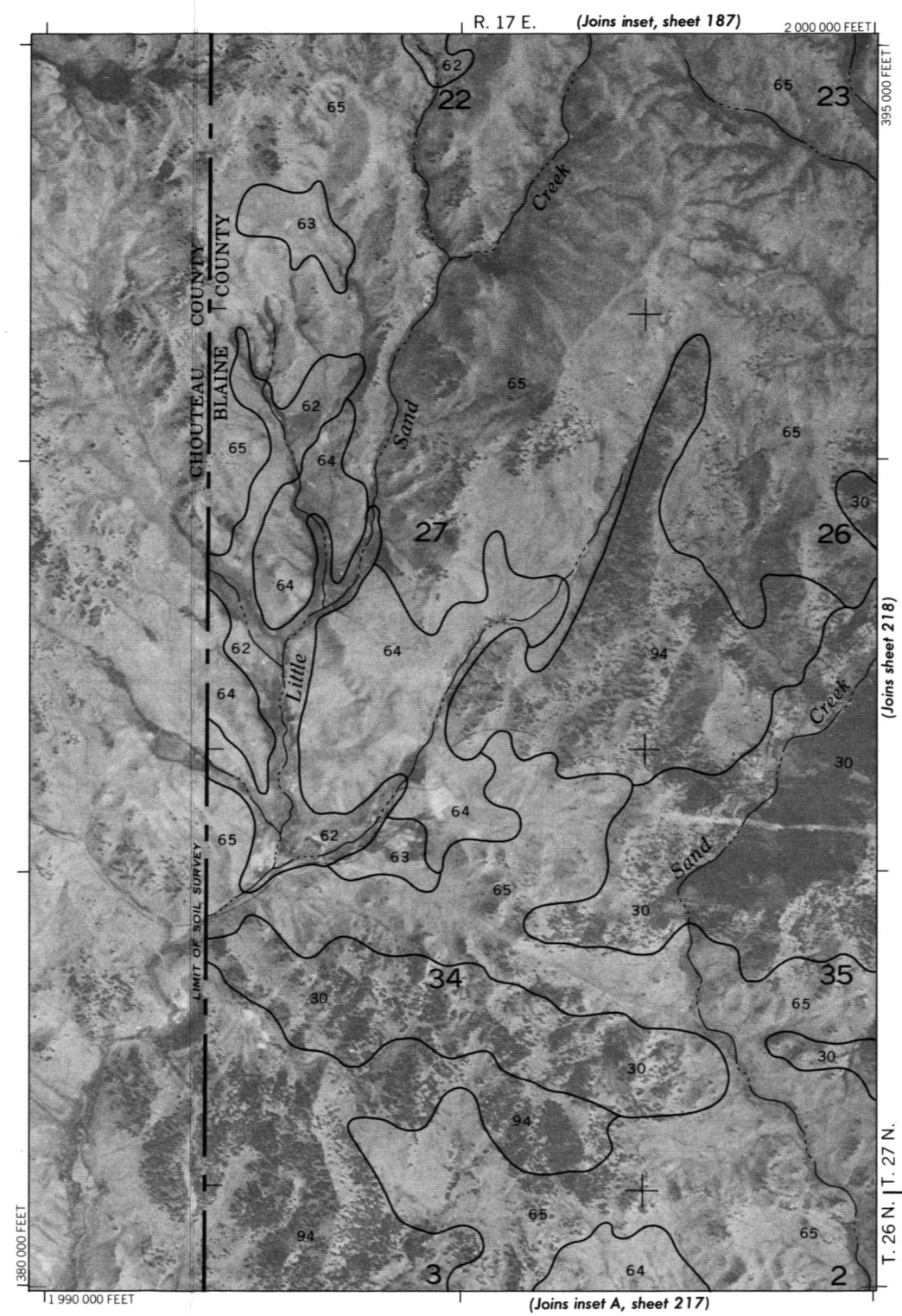
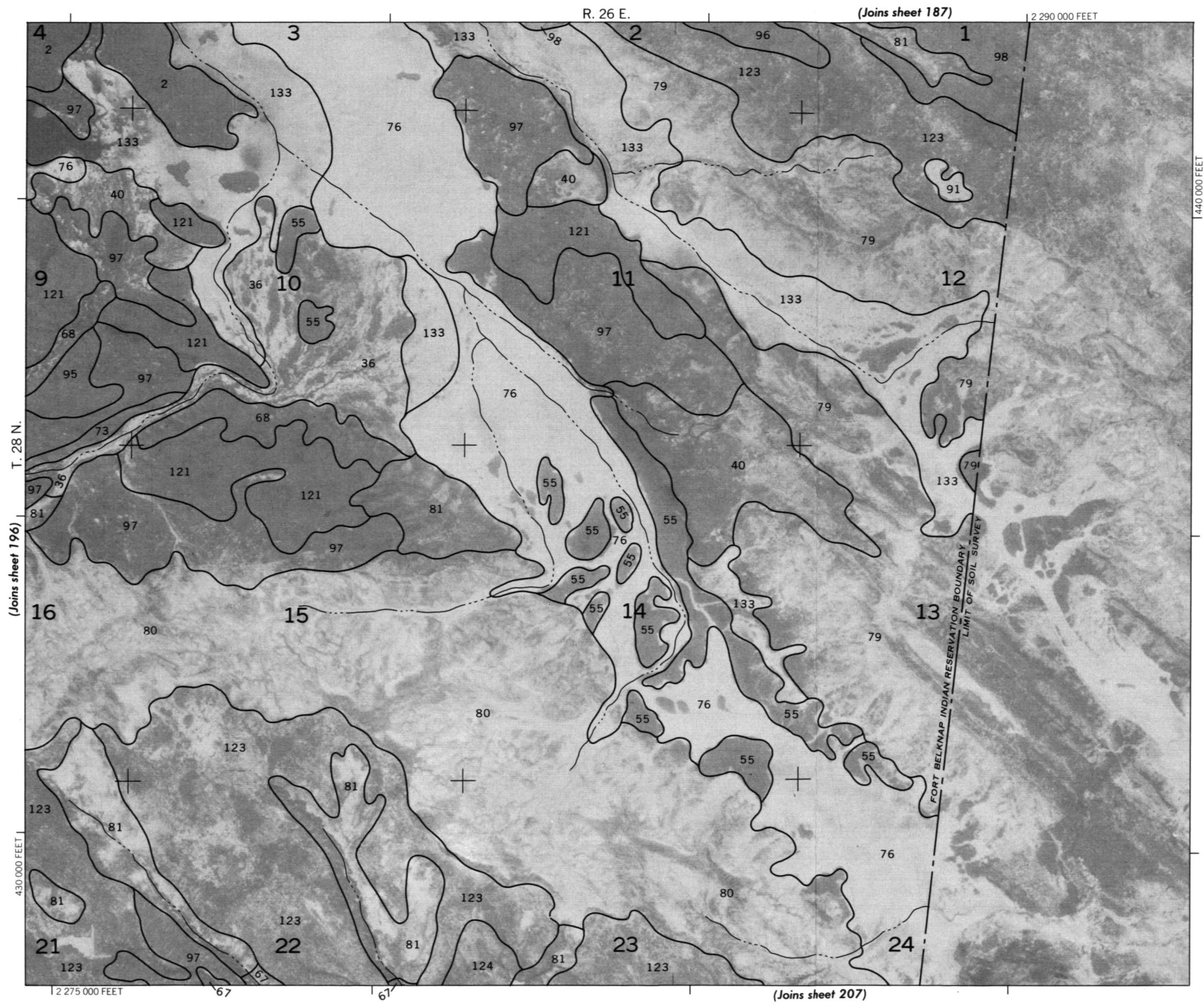
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

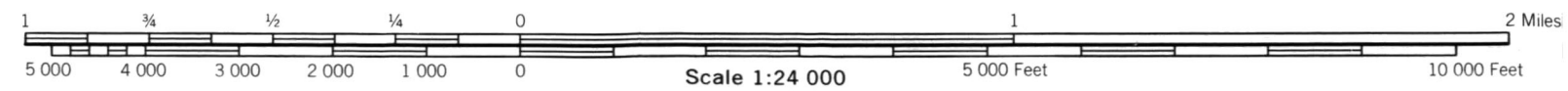
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

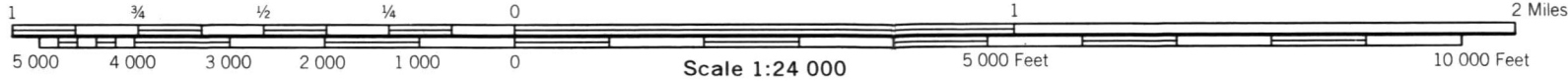


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 198

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 199

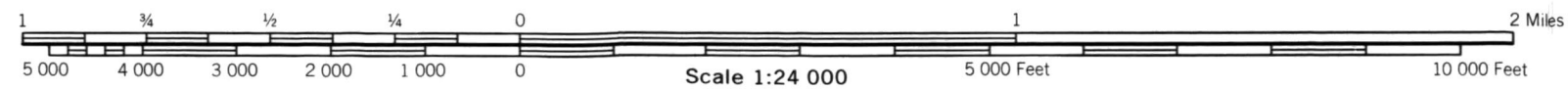
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

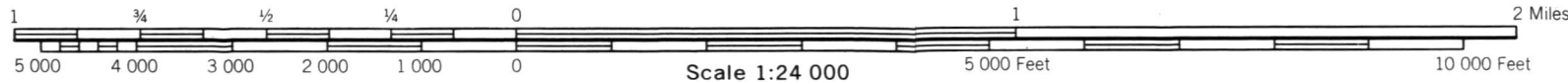
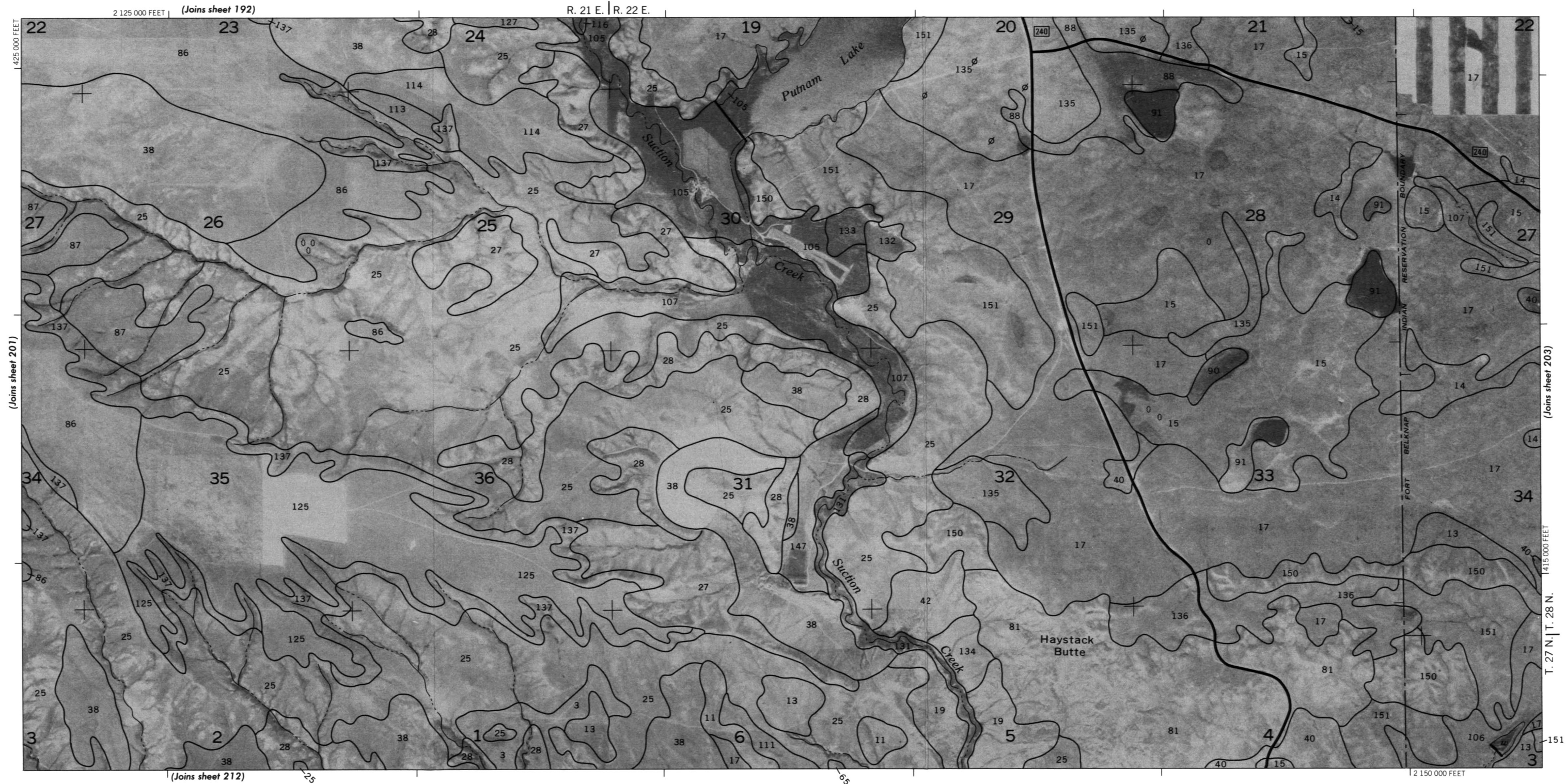




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

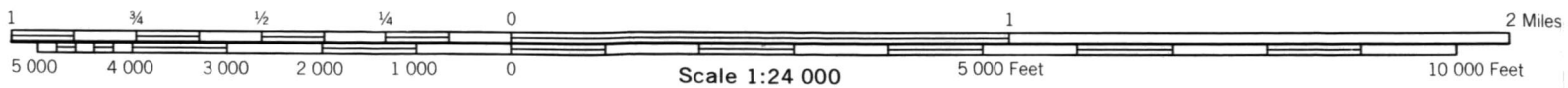
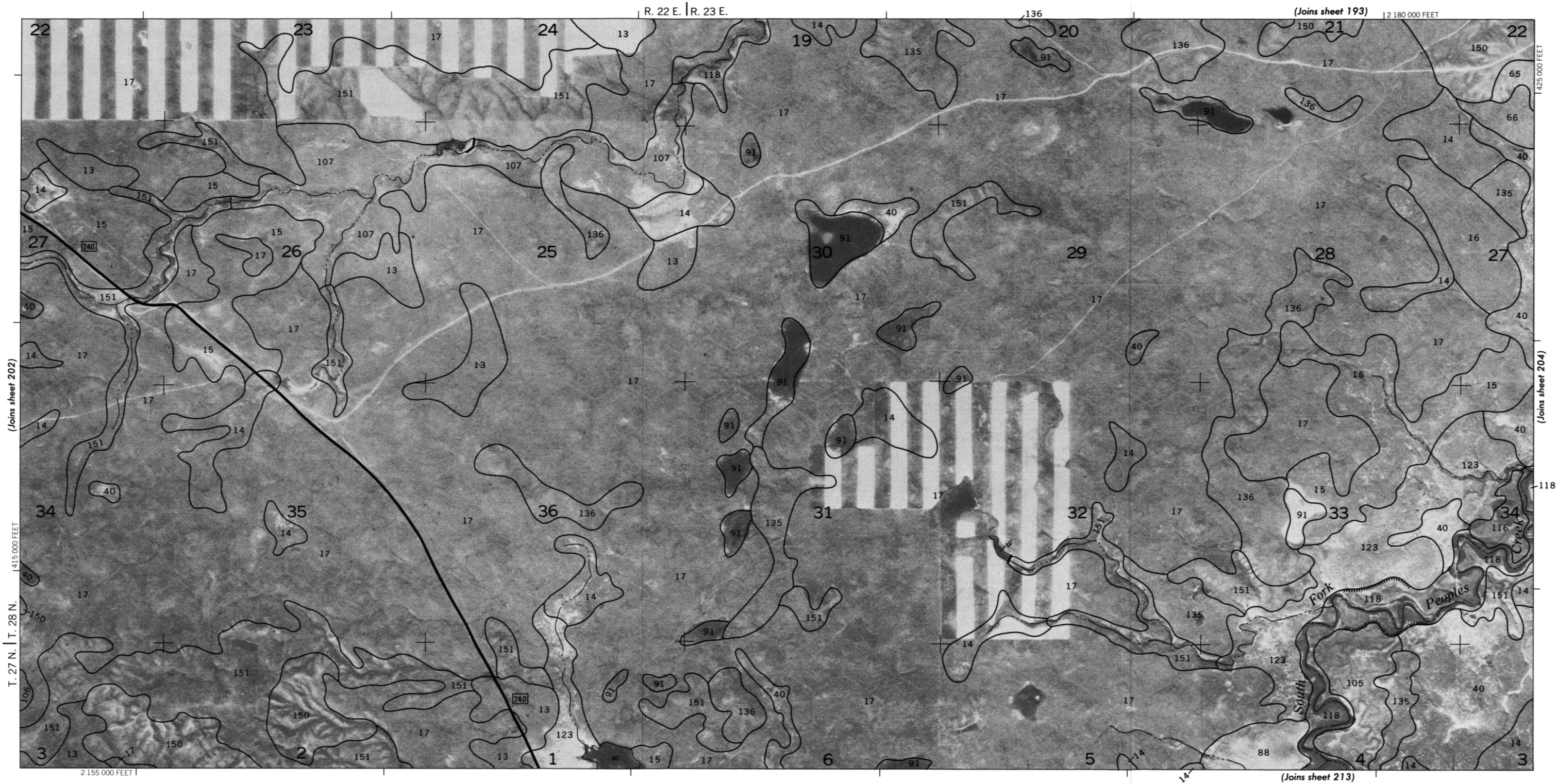


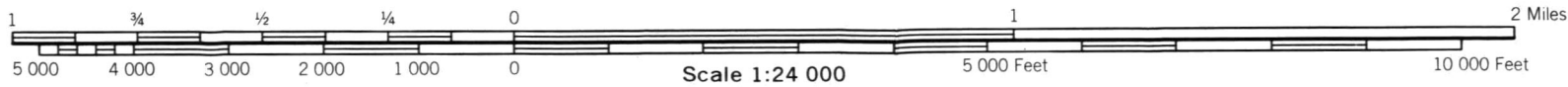
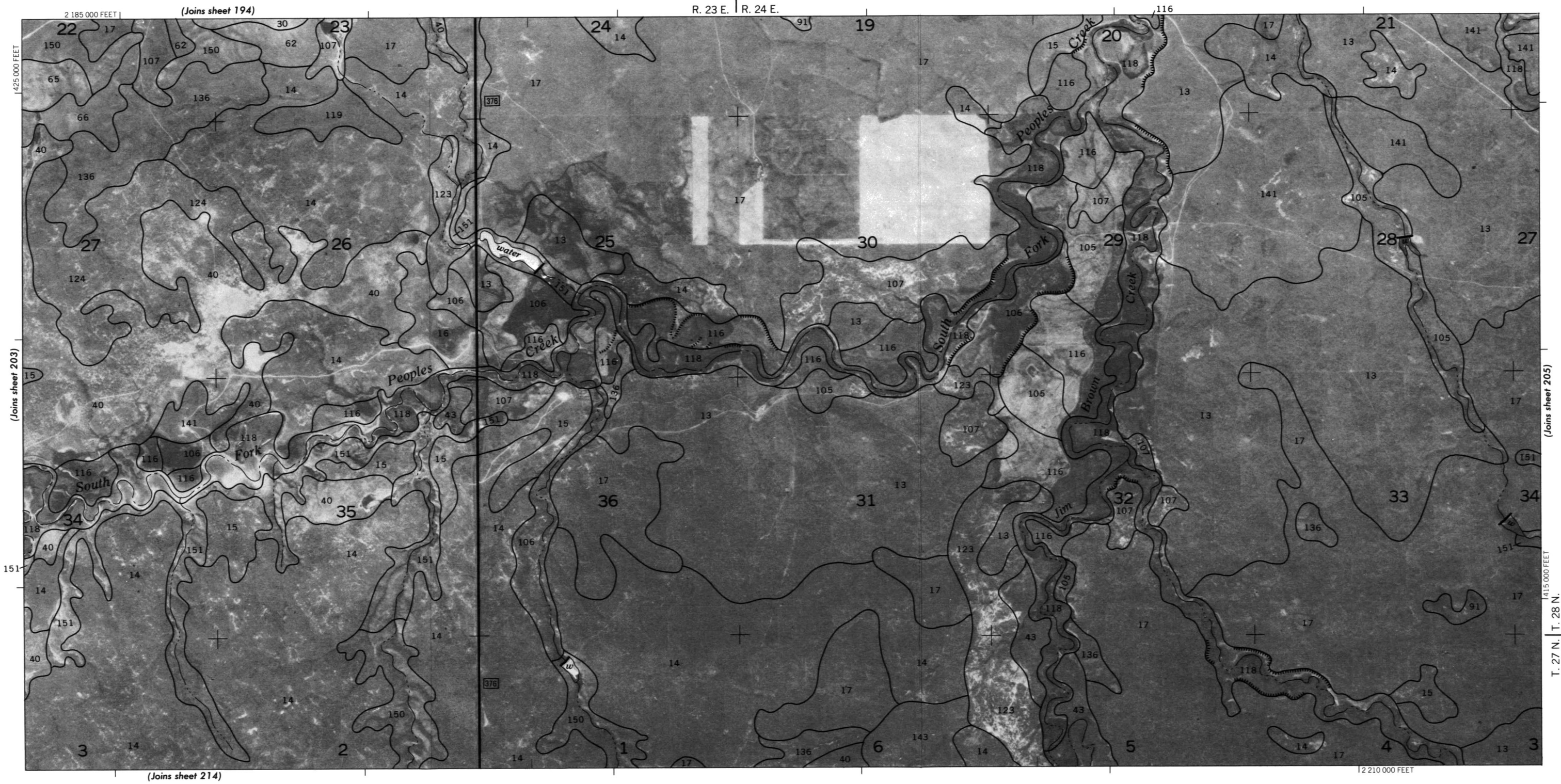


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 203

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

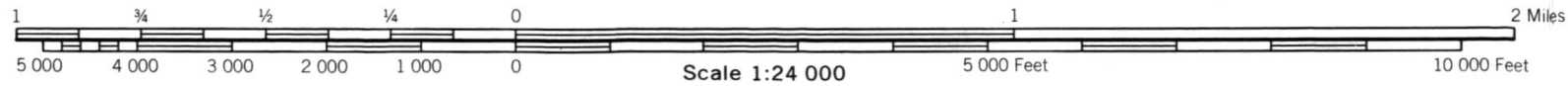
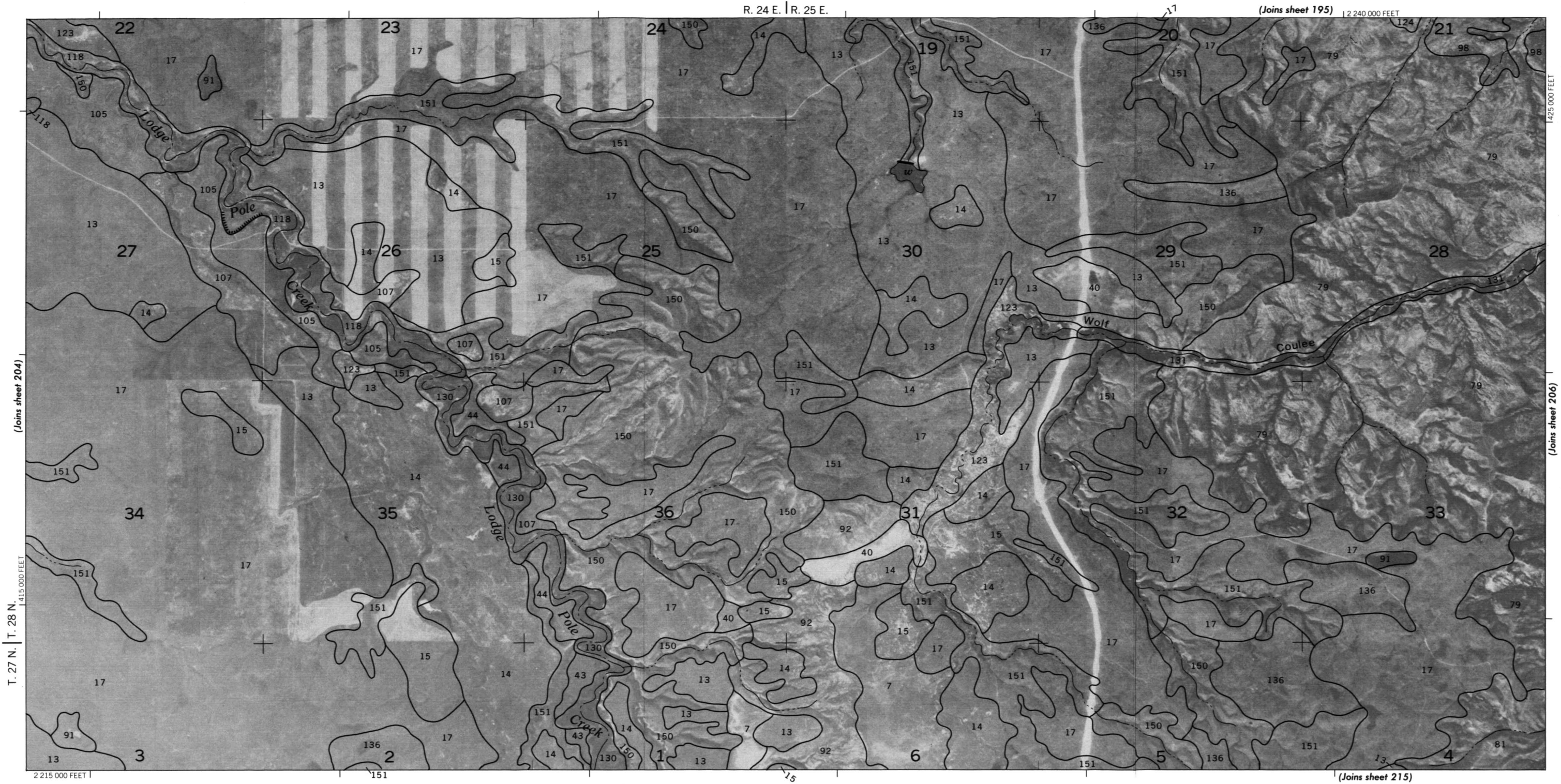


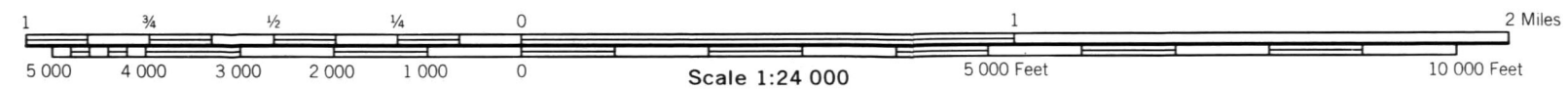


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 205

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





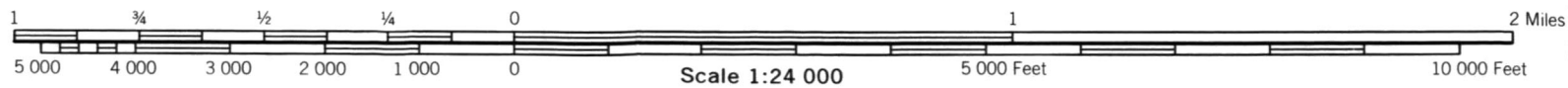
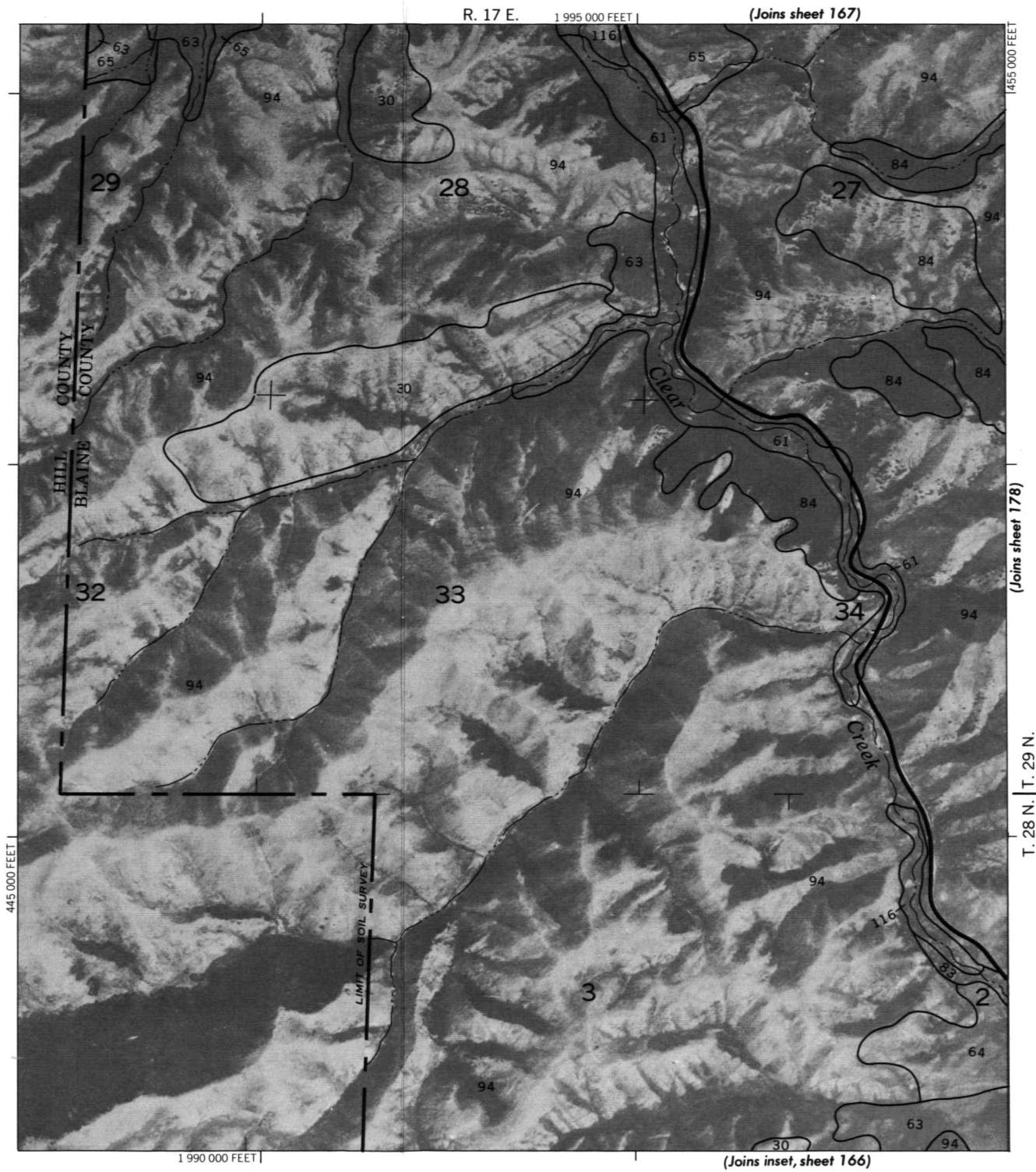
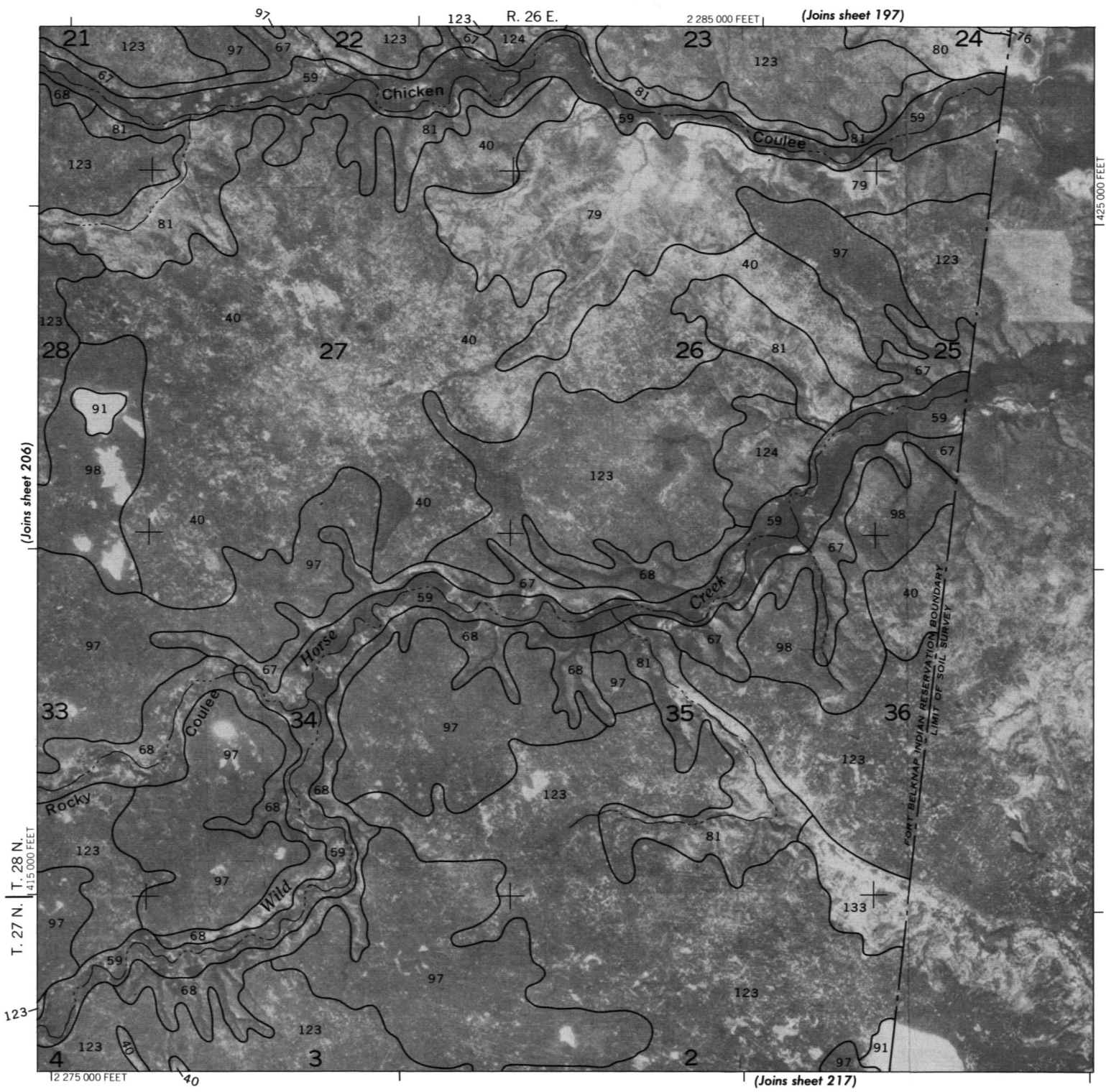
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

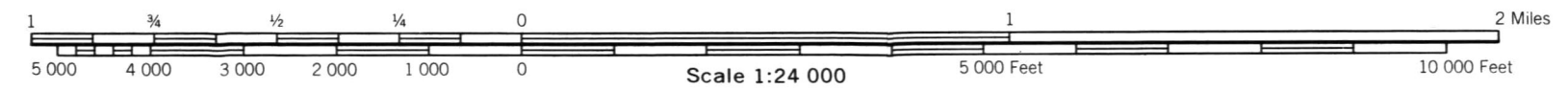
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 207

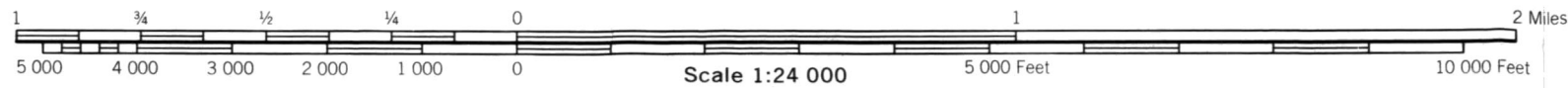
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

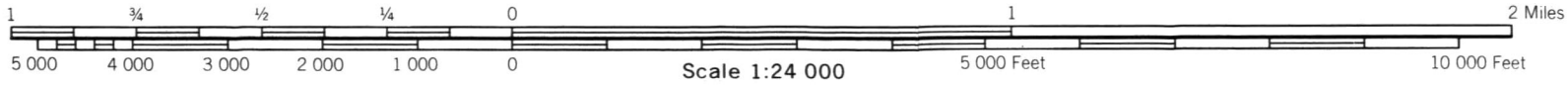
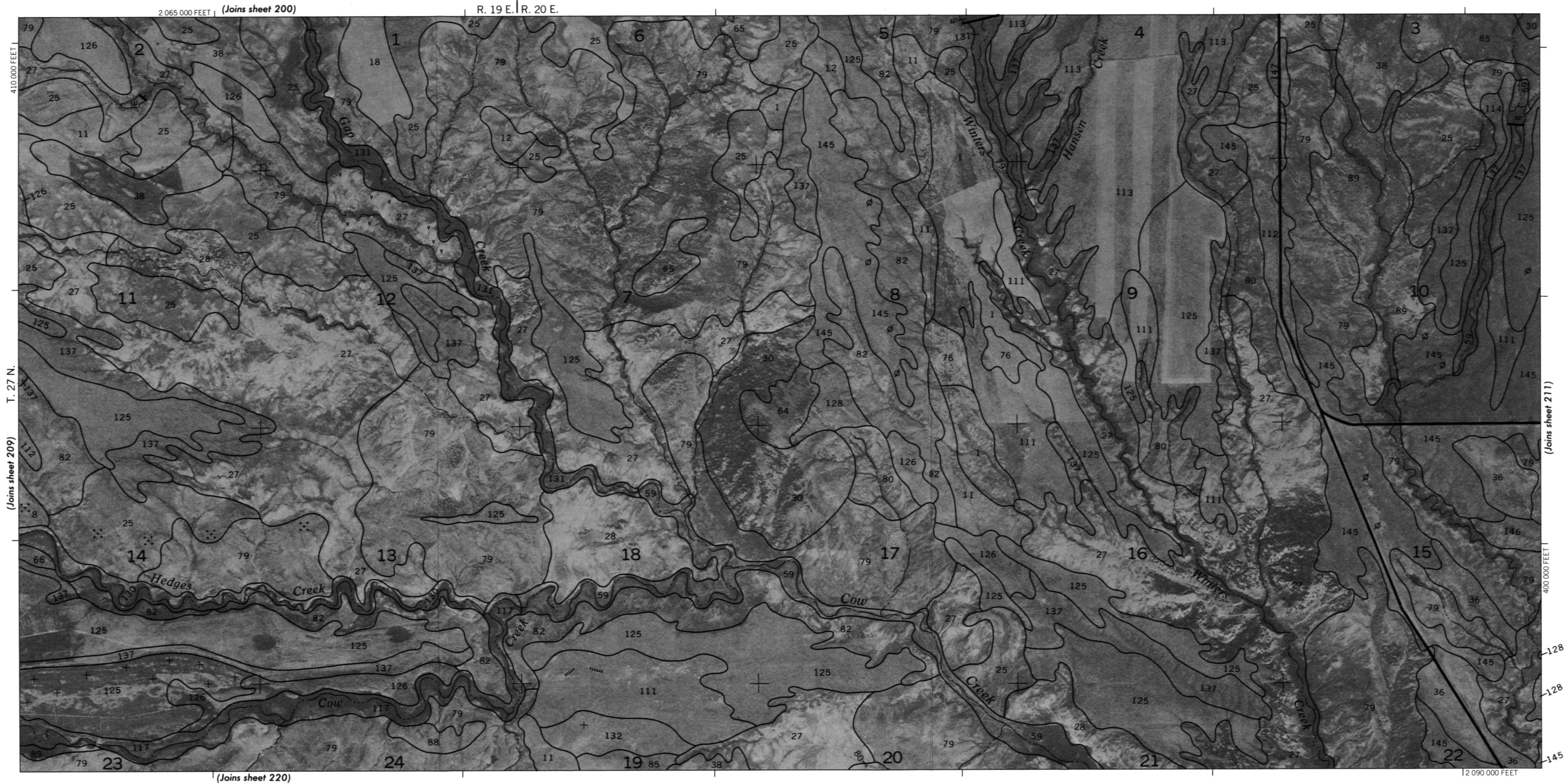




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

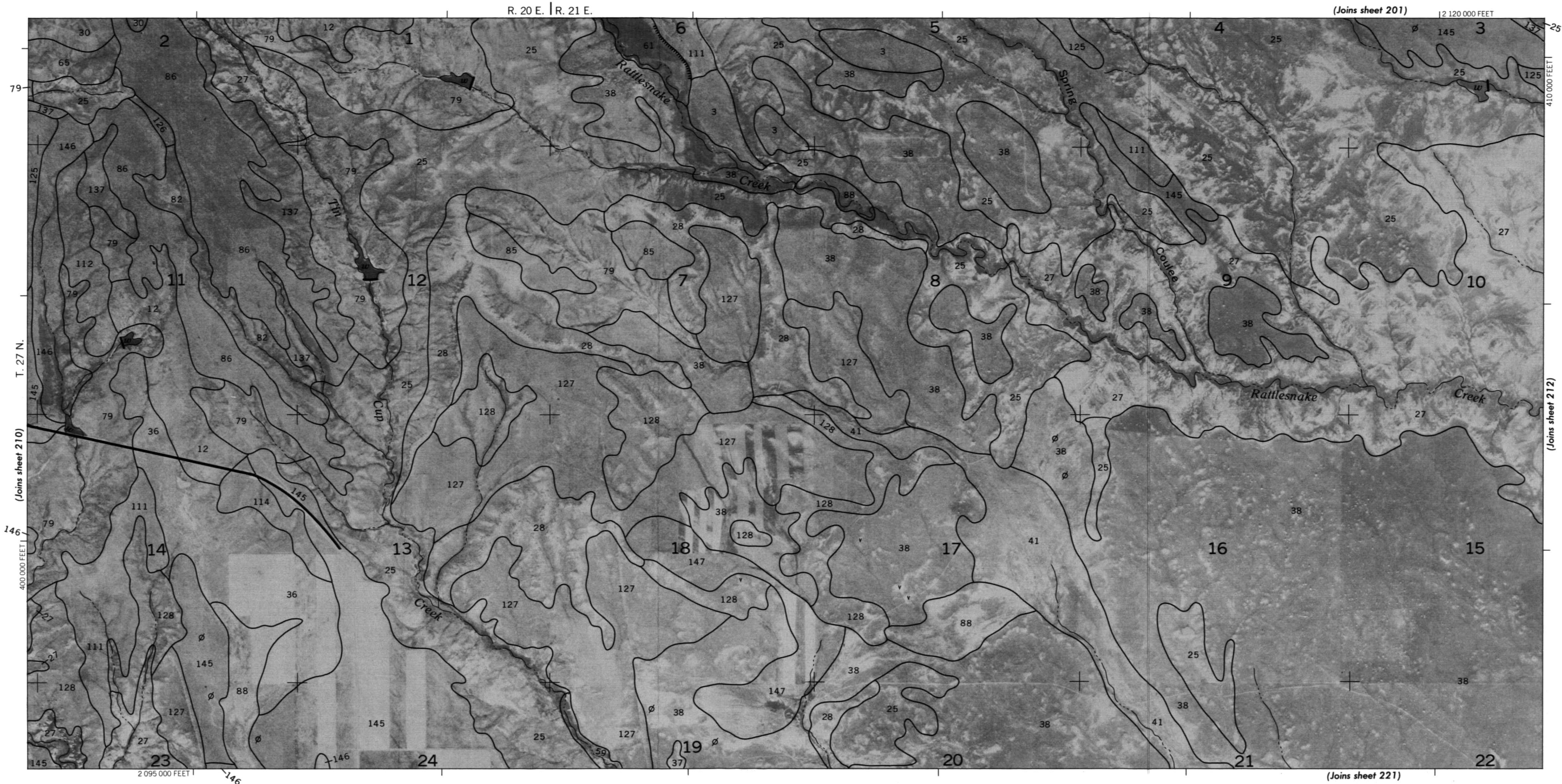
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

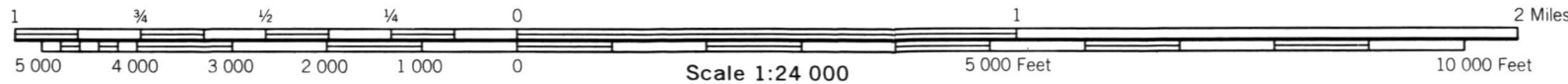
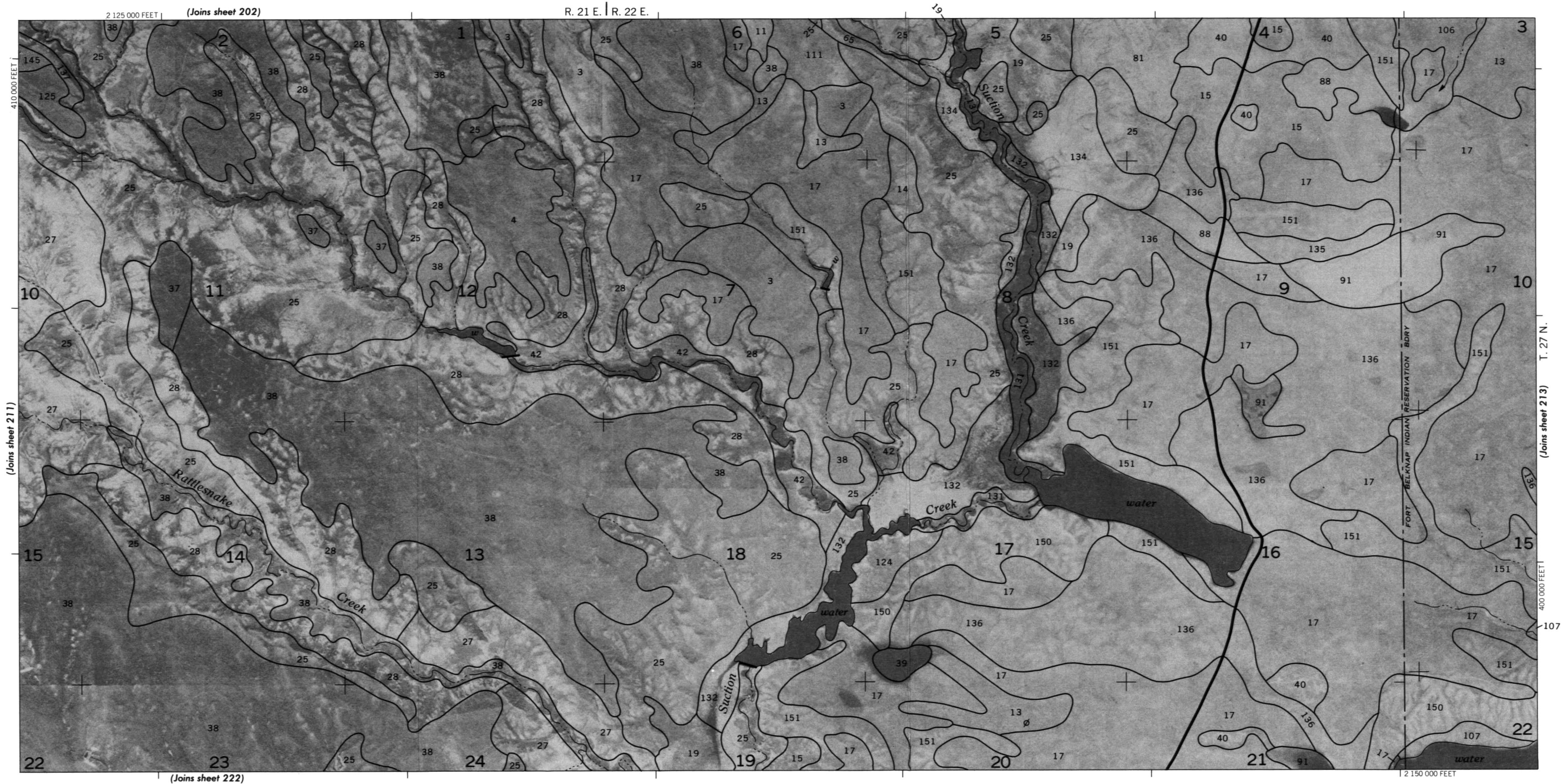




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

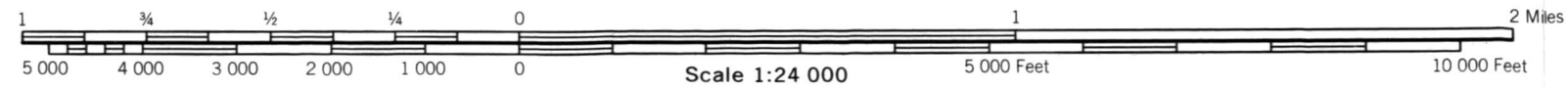
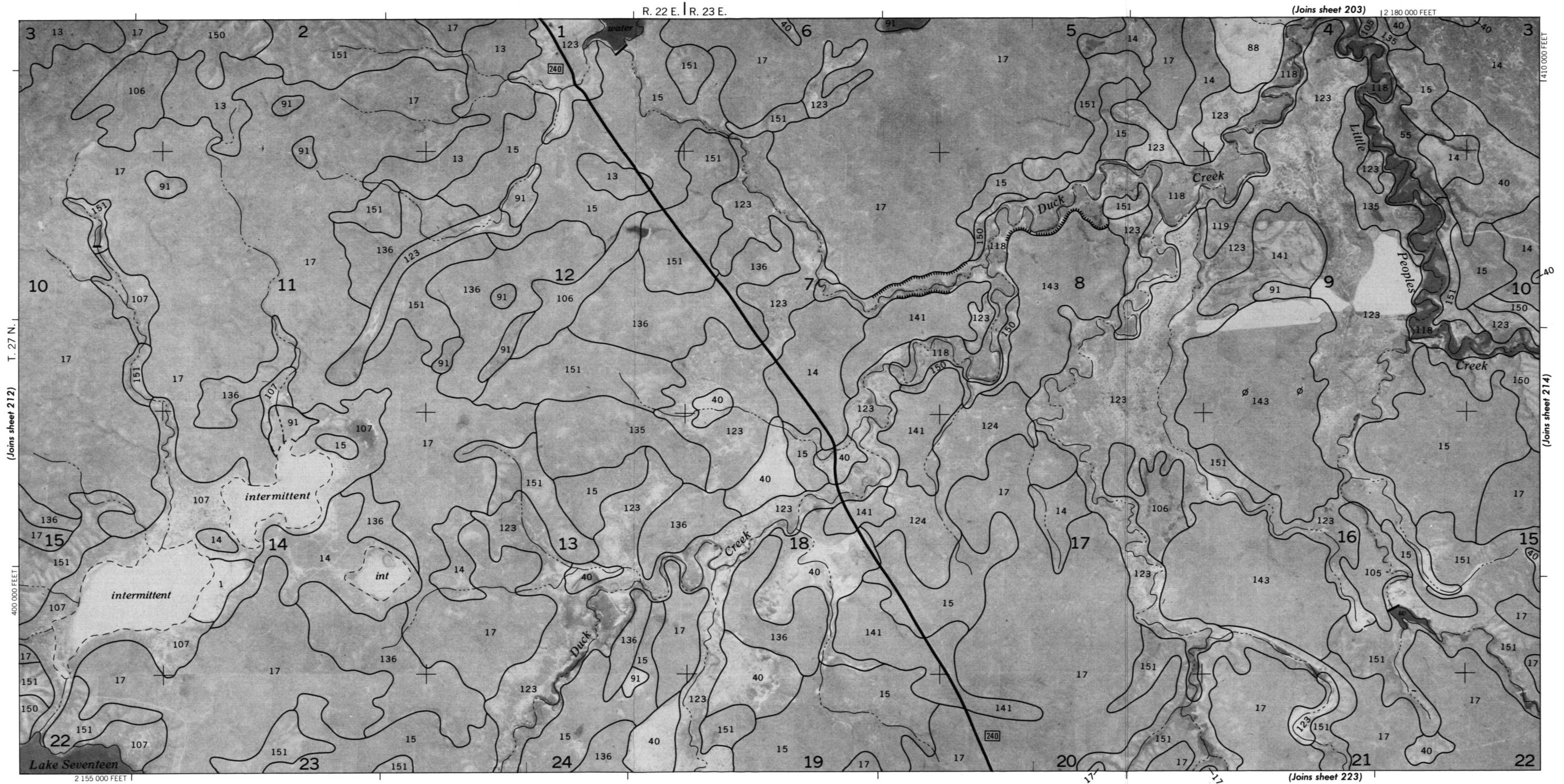


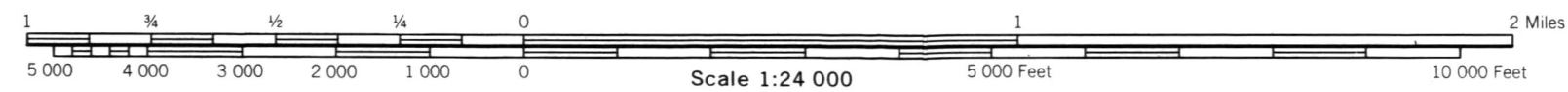
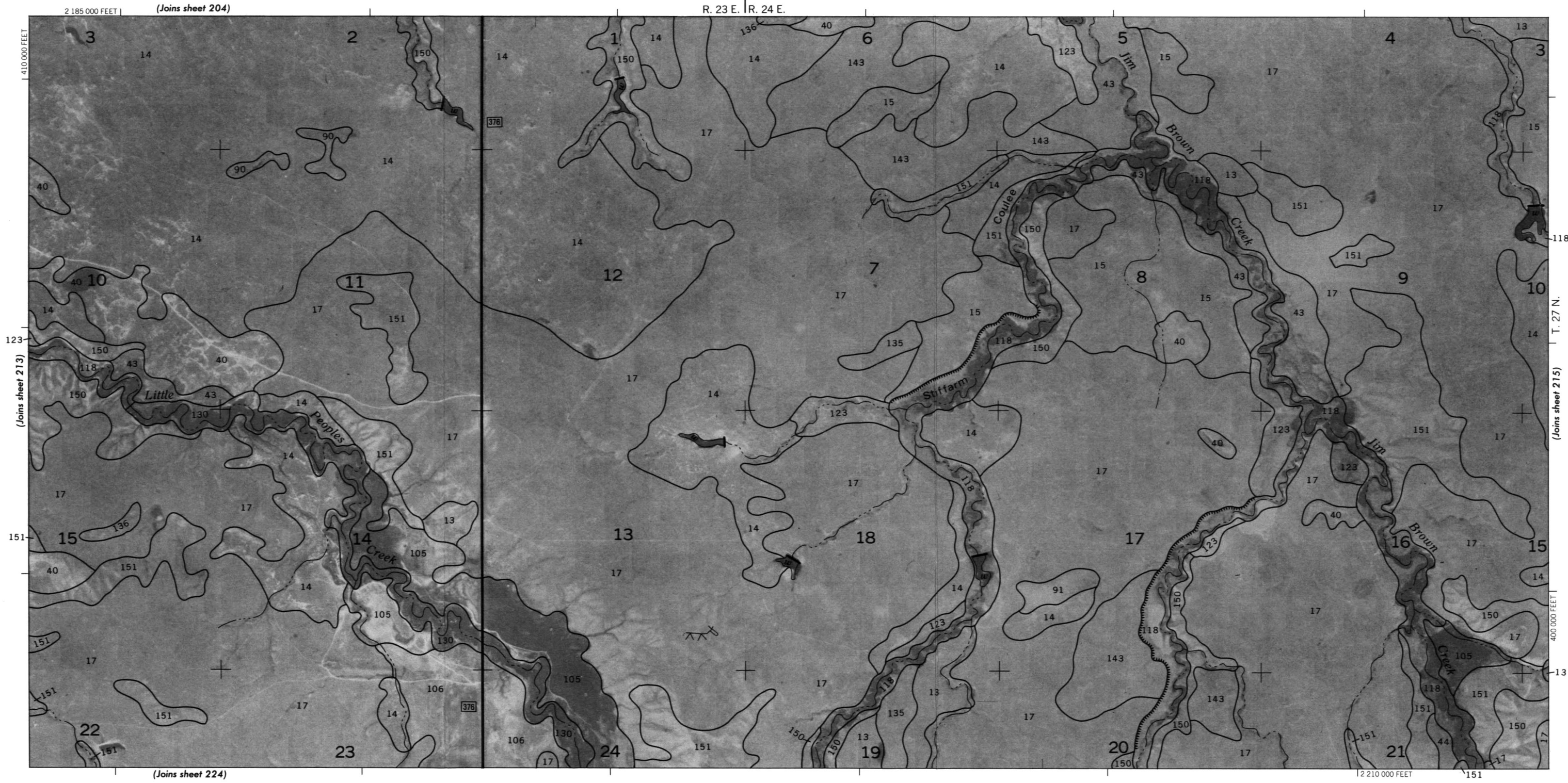


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

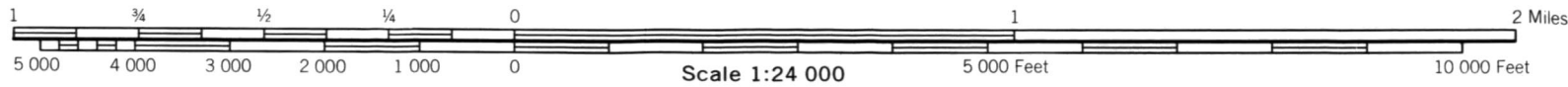
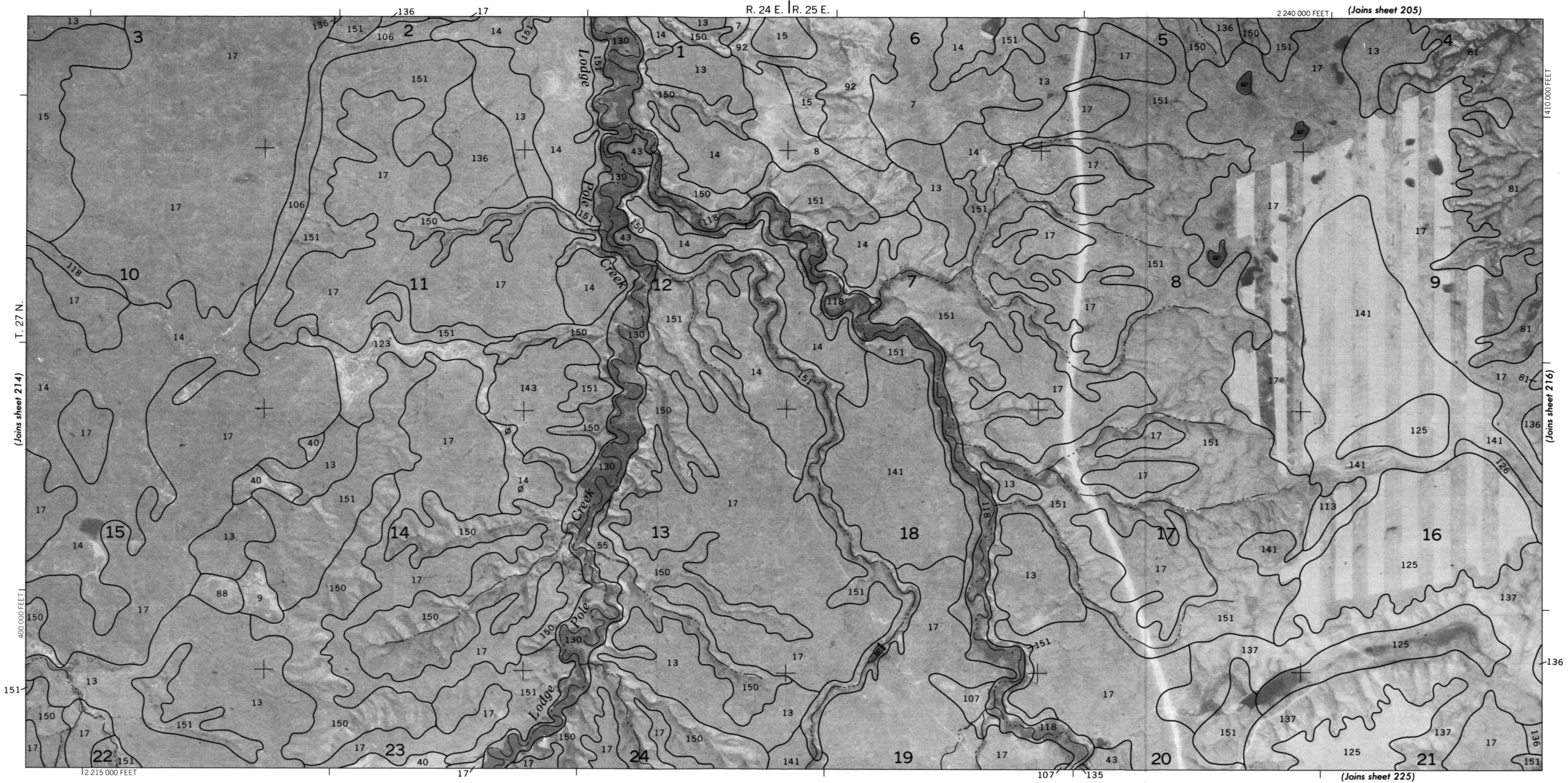
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 213

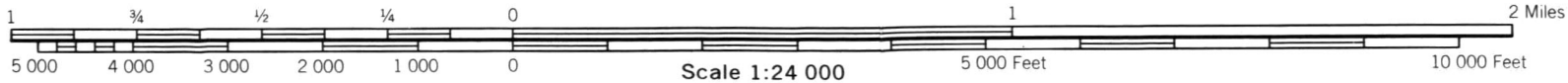
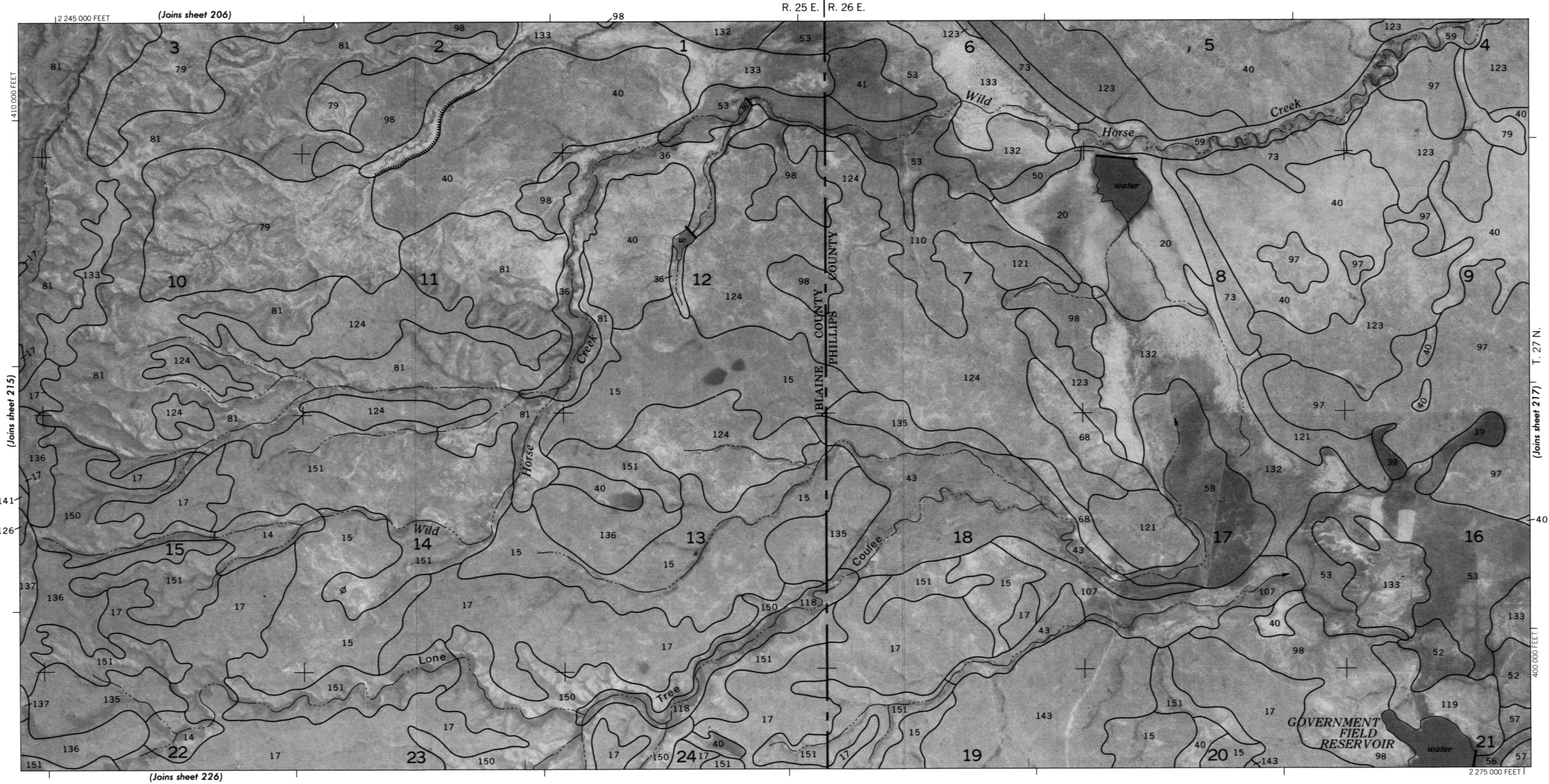




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

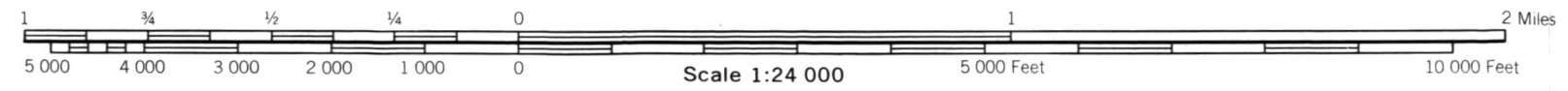
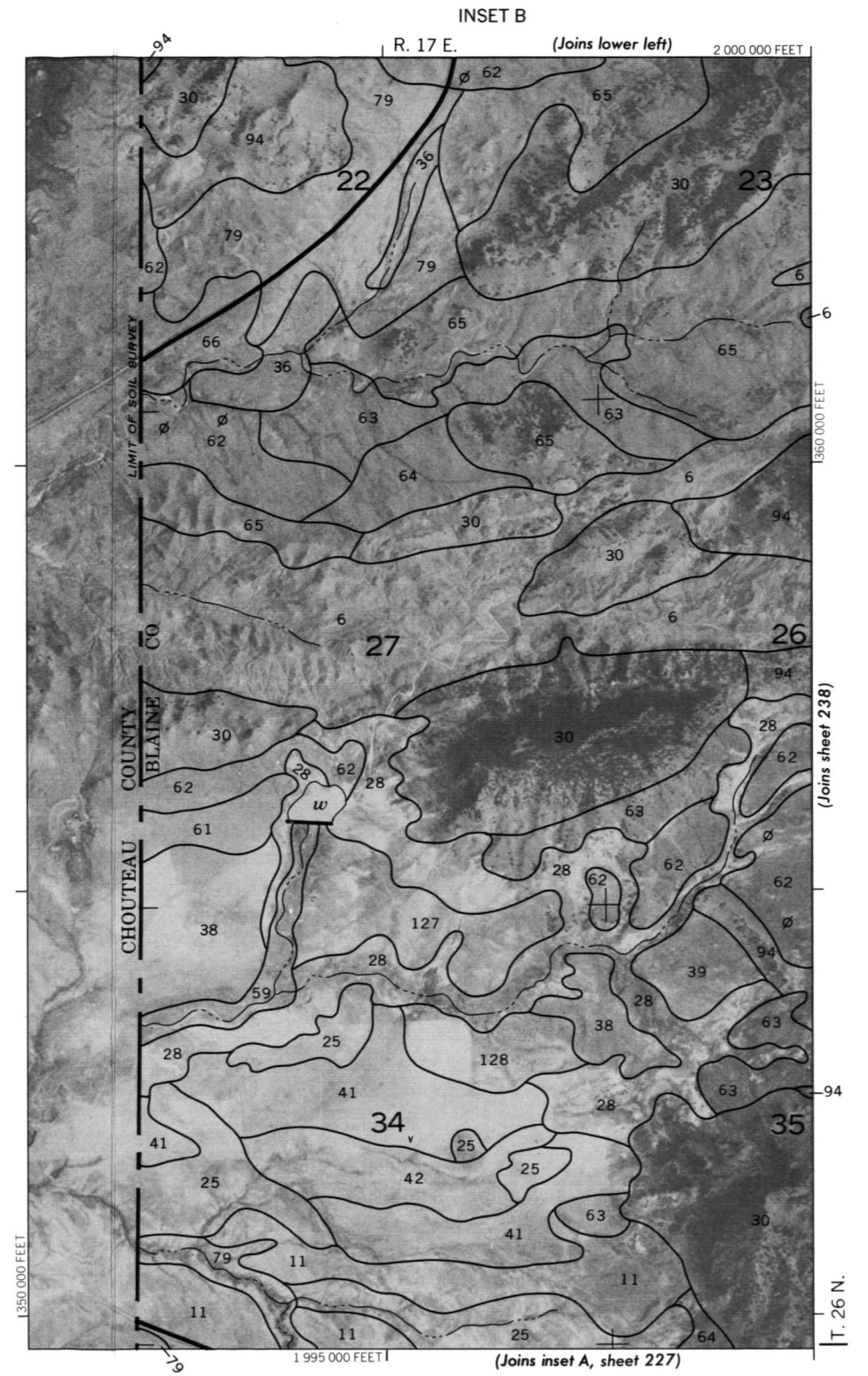


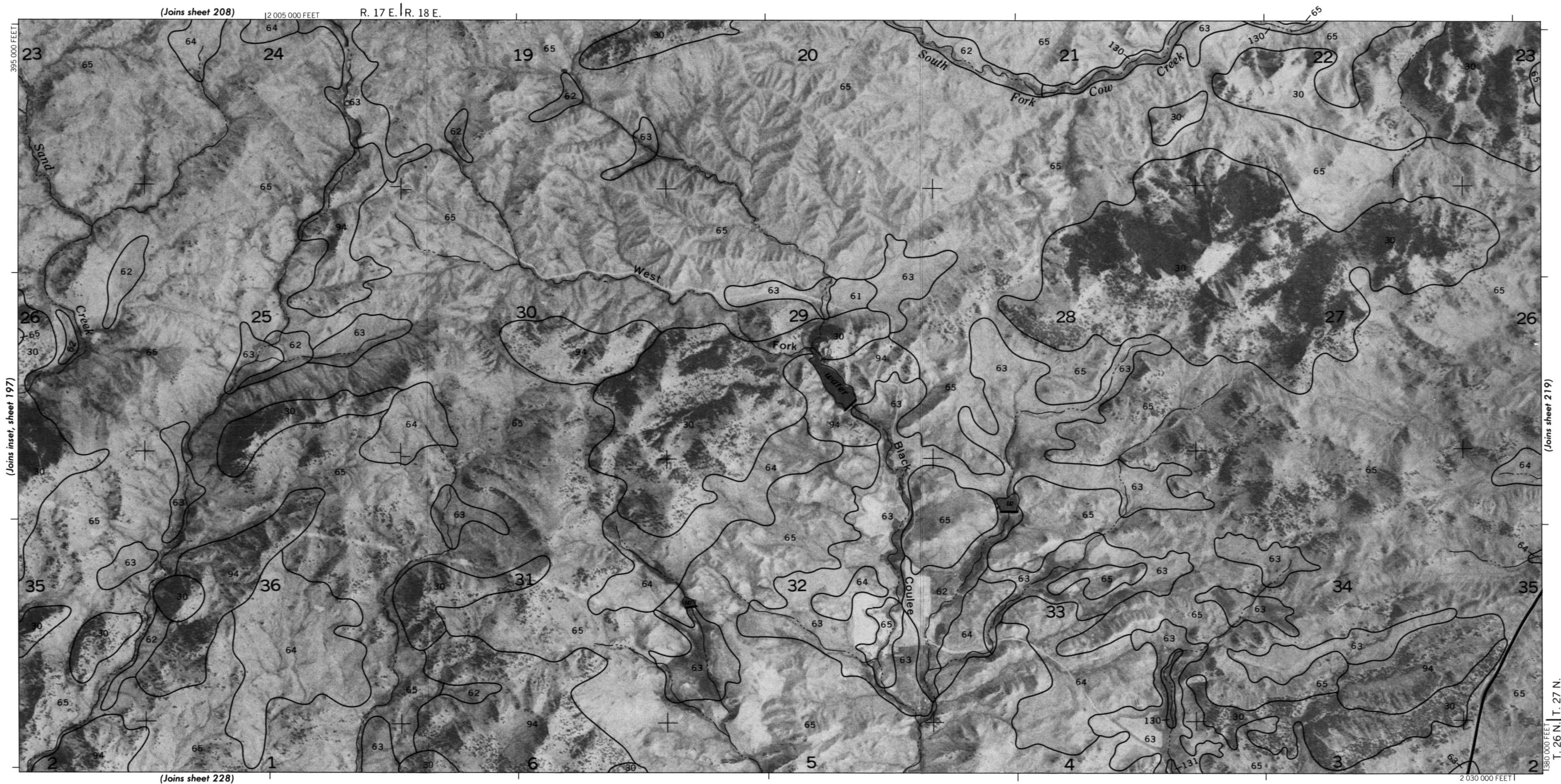


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 217

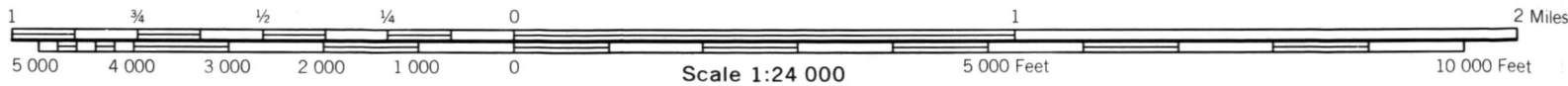




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

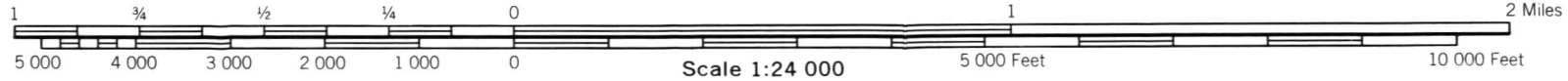
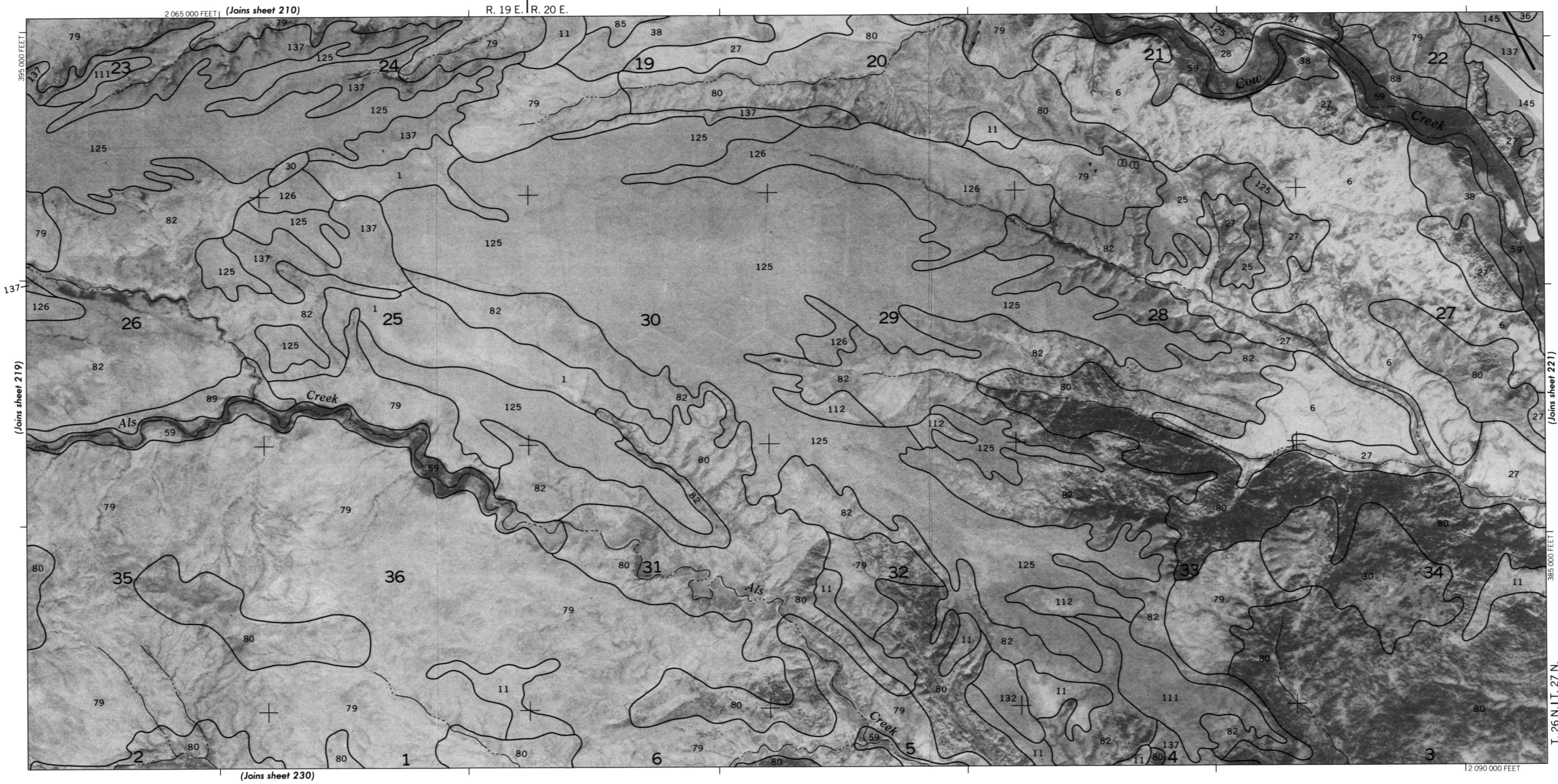
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 219

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

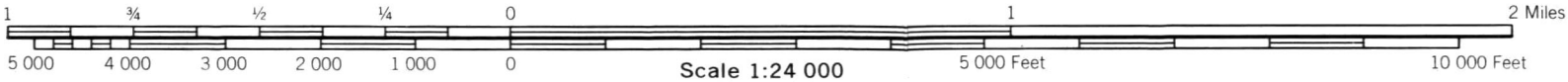
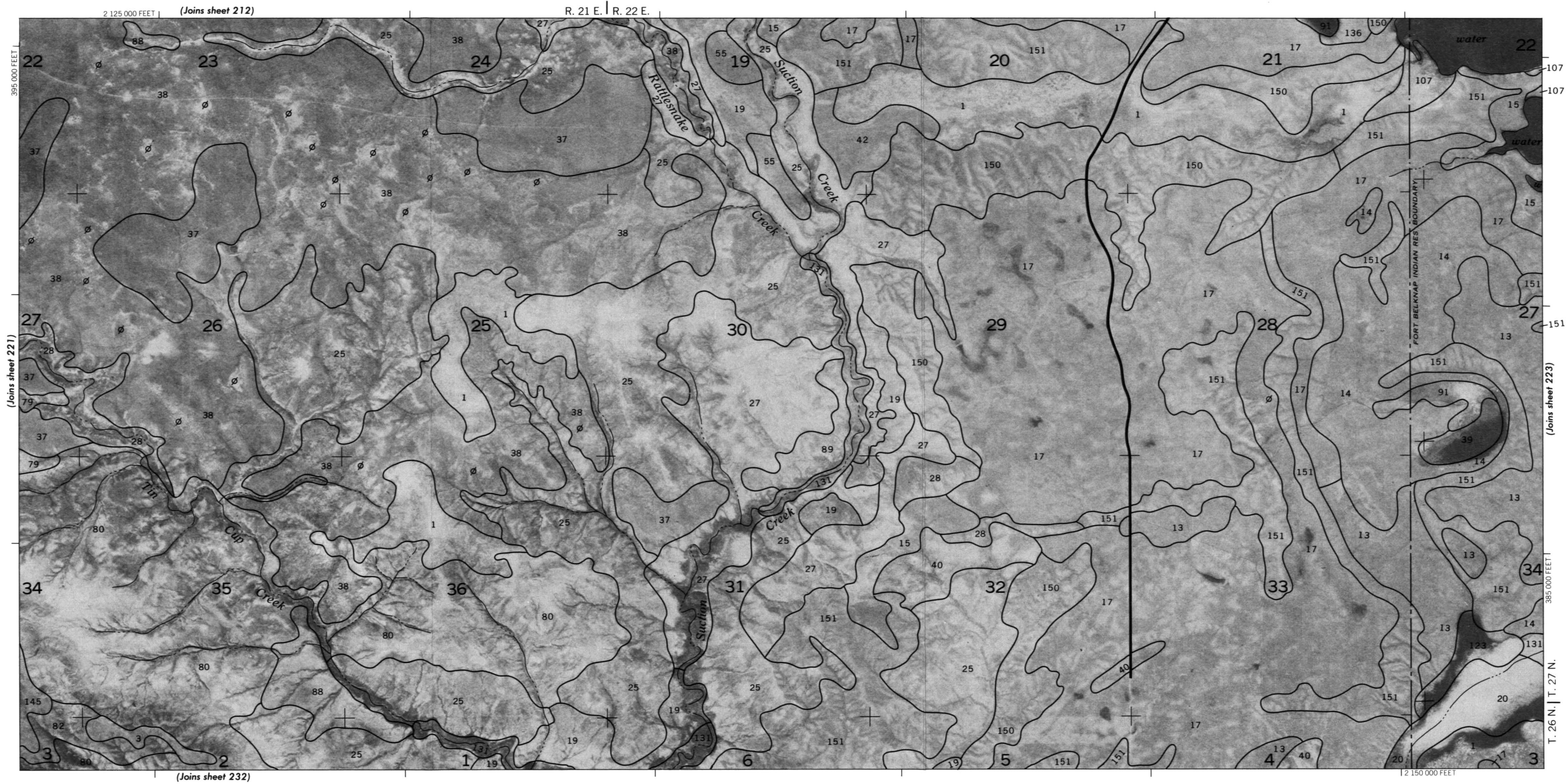




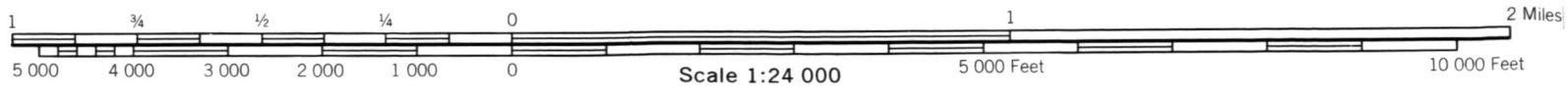
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 220



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

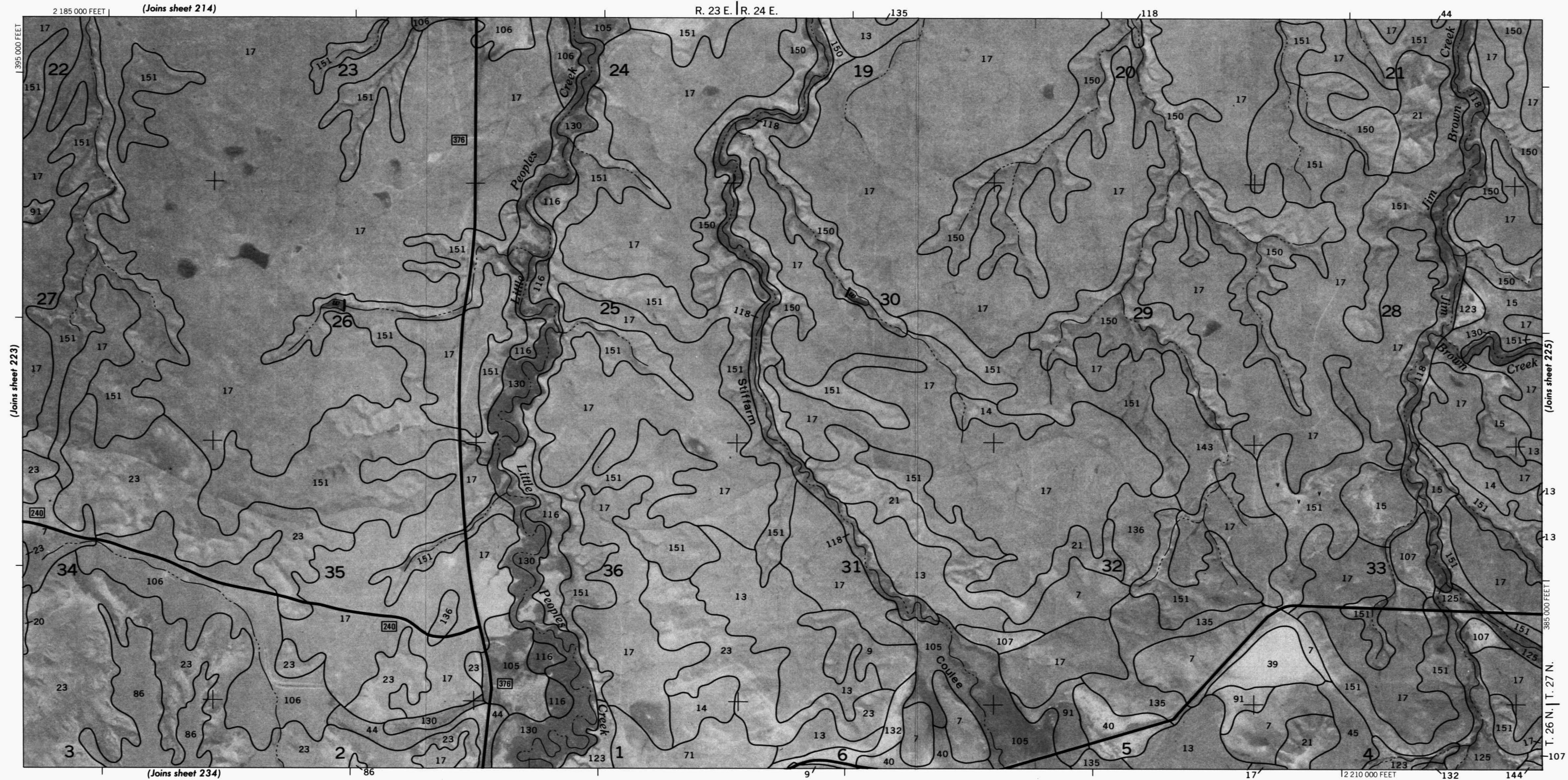


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

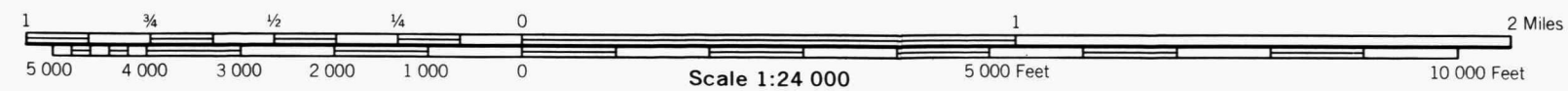


BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 223

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

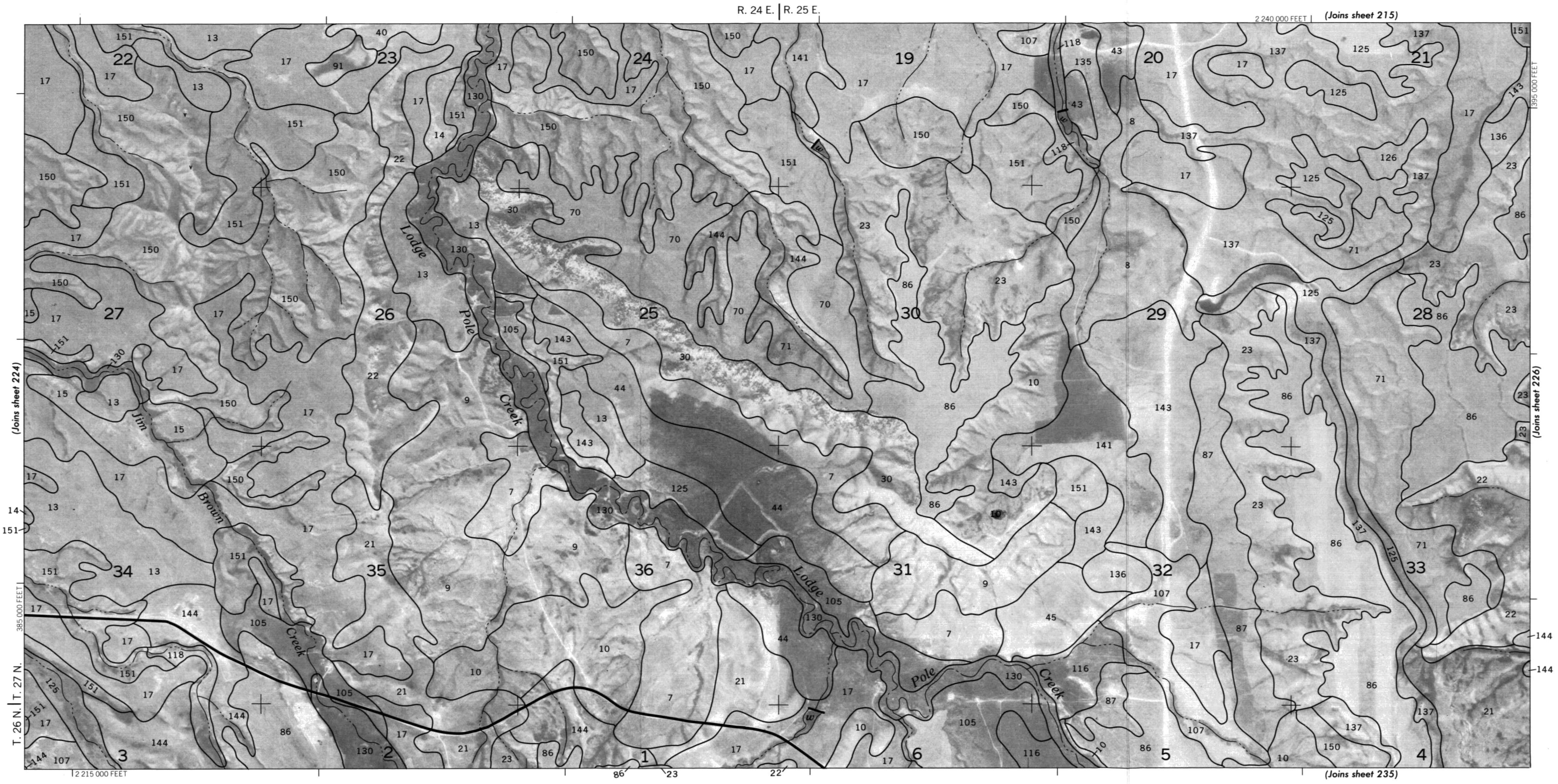


Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



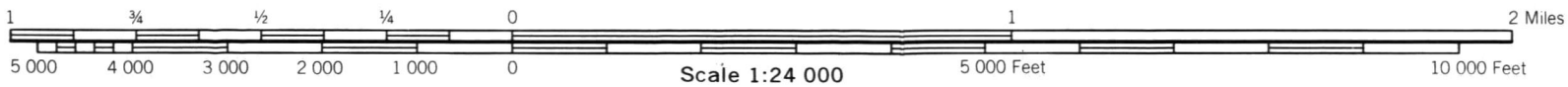
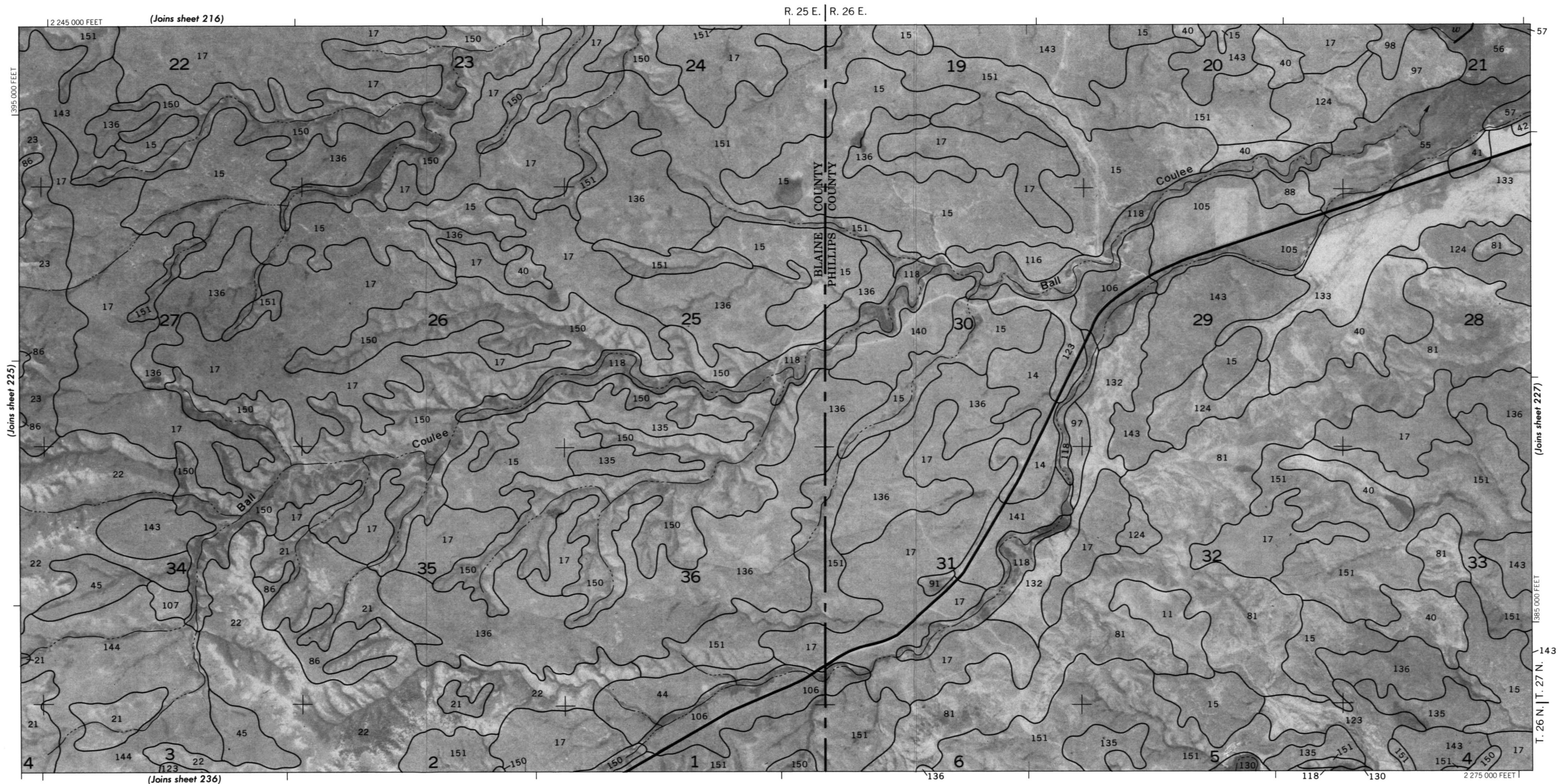
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 225





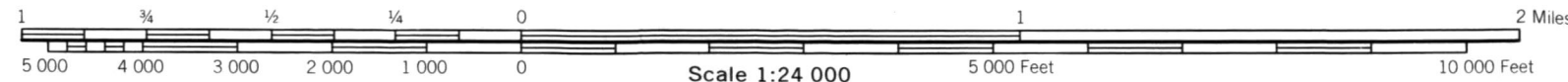
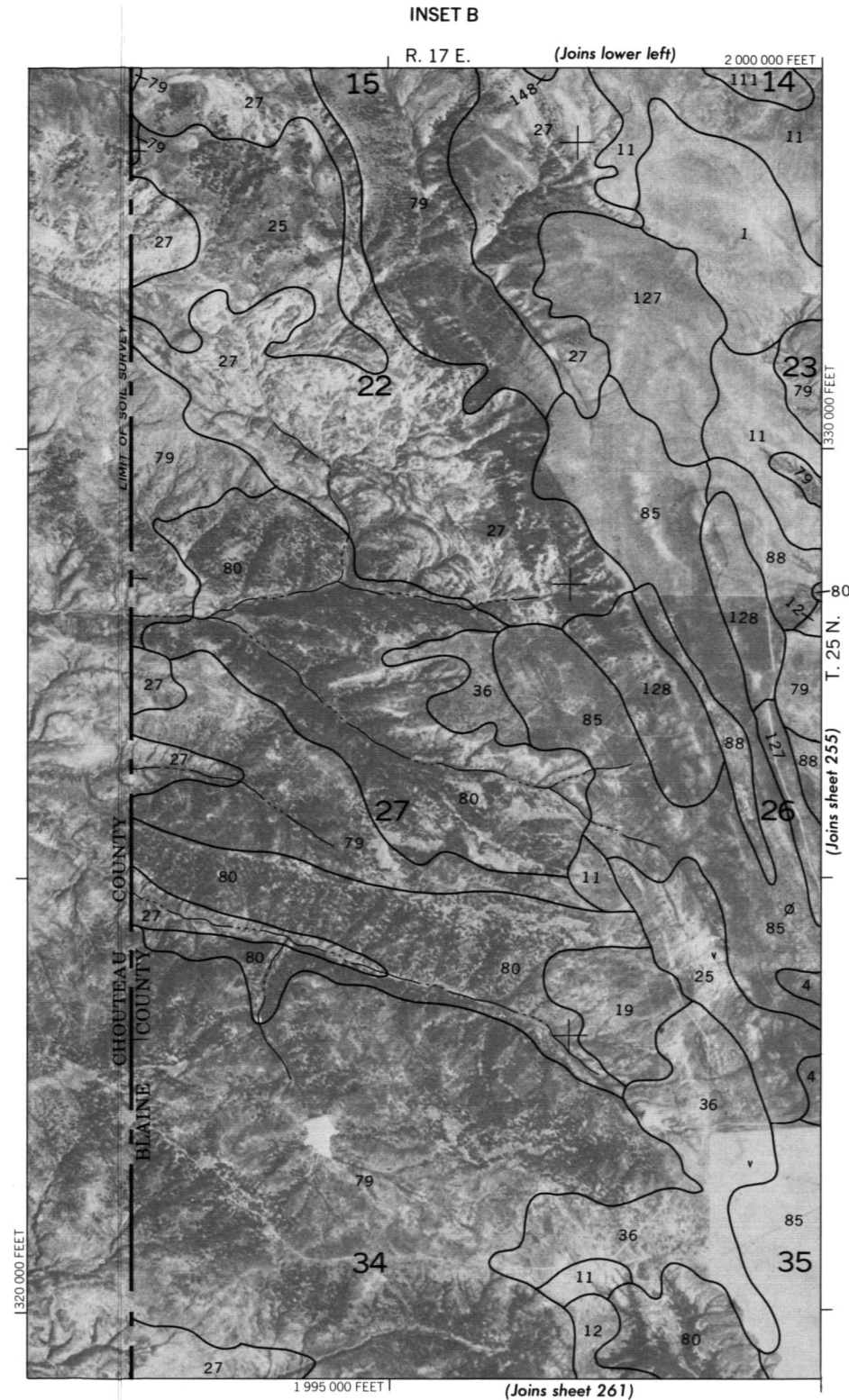
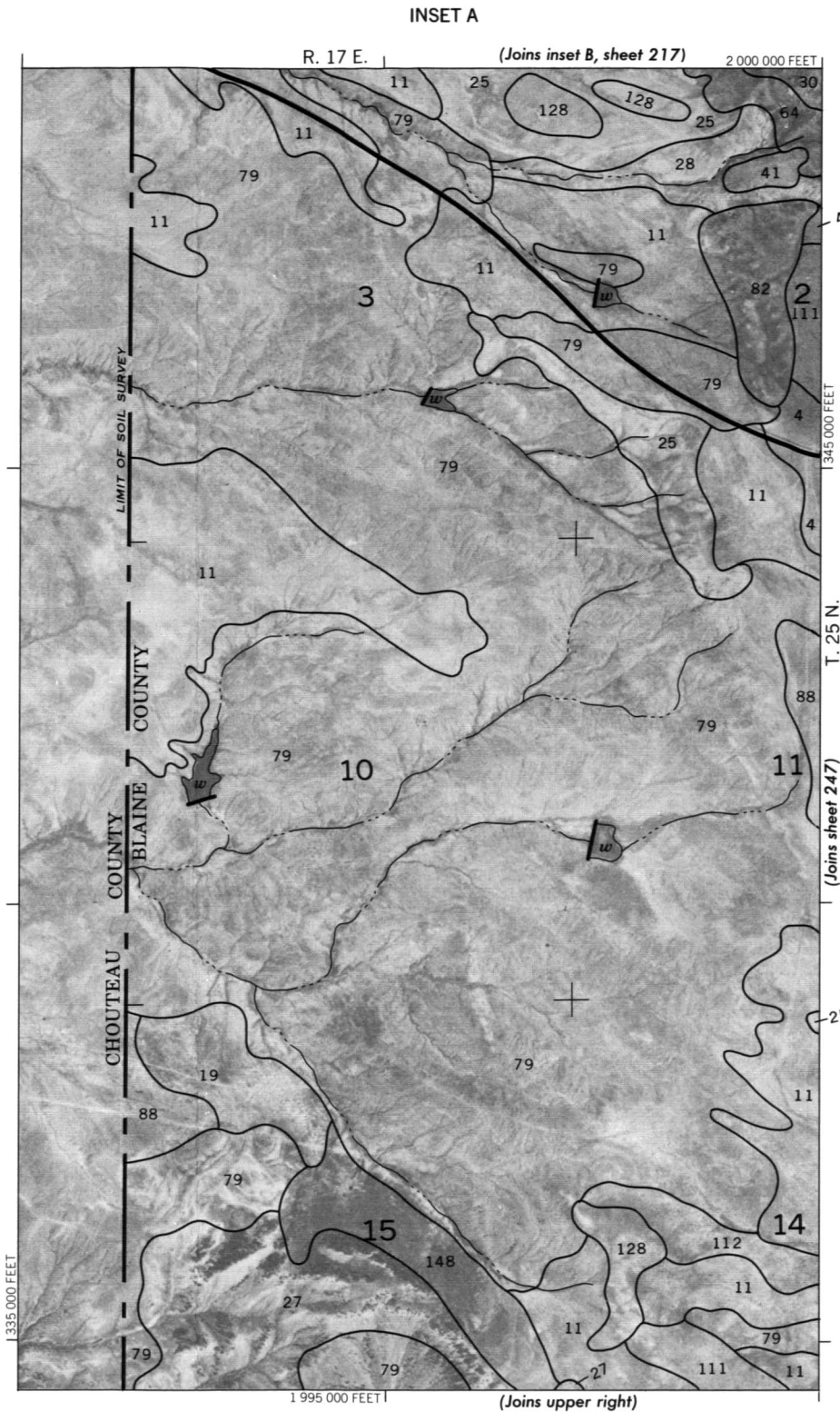
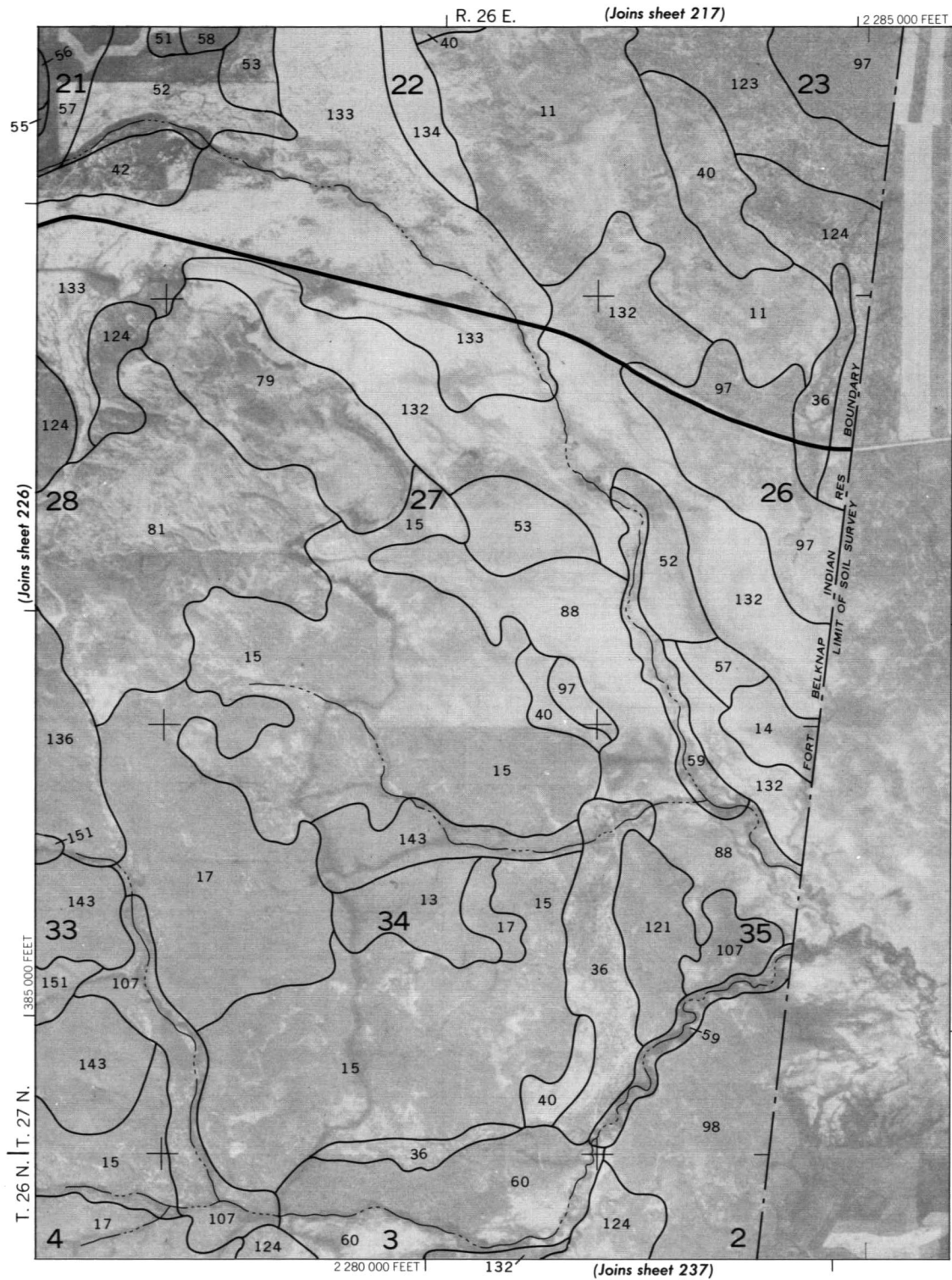
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 226

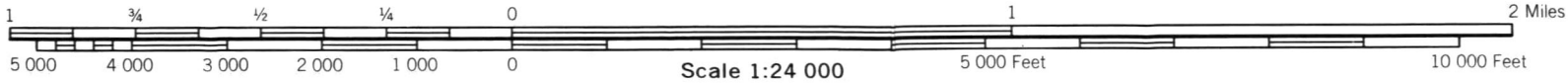
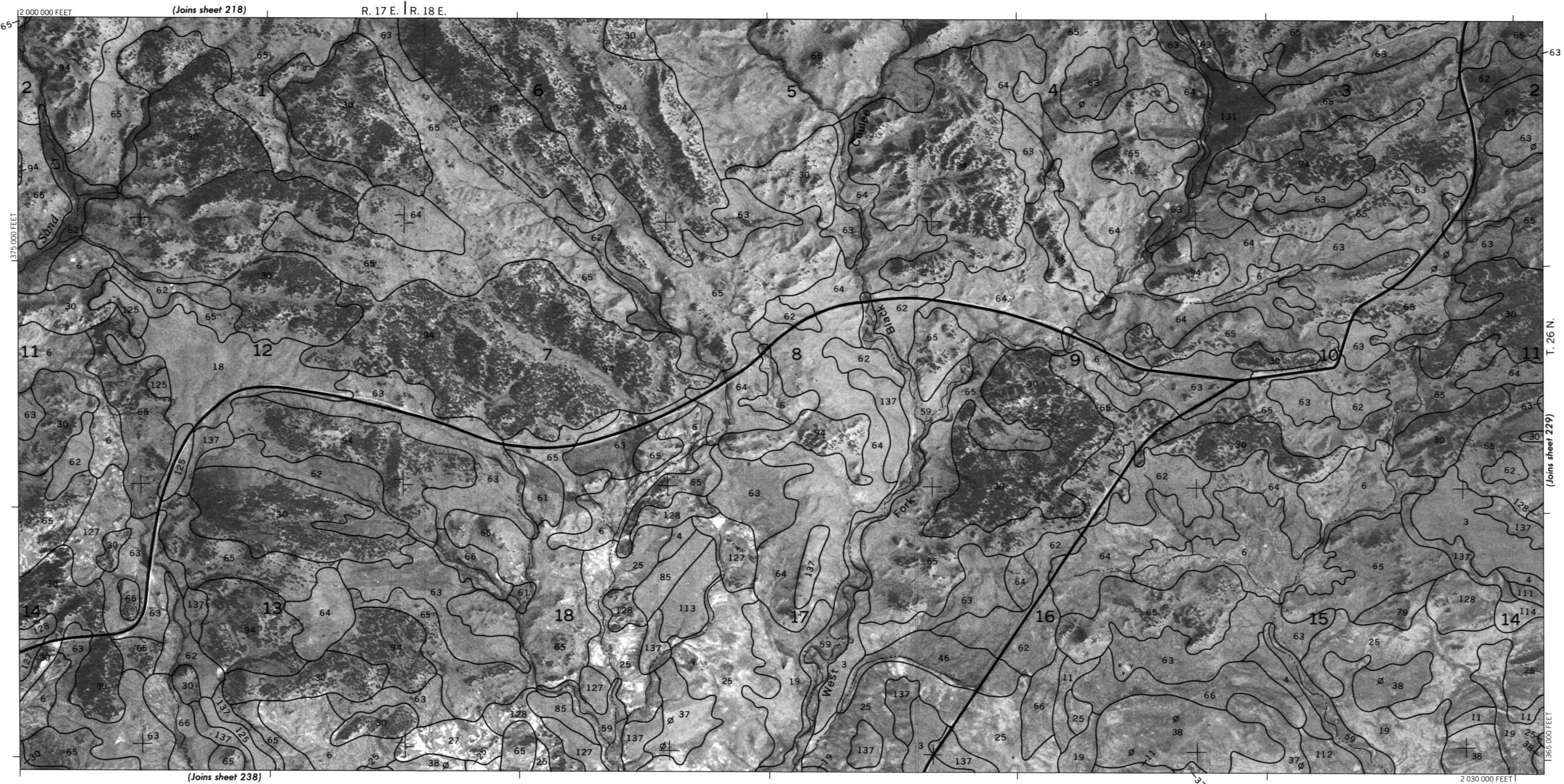


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 227

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

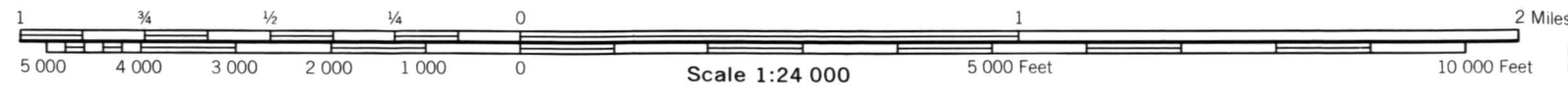


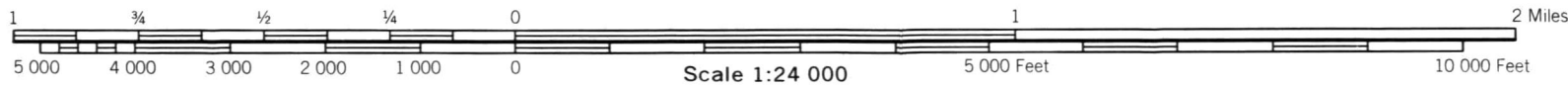


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

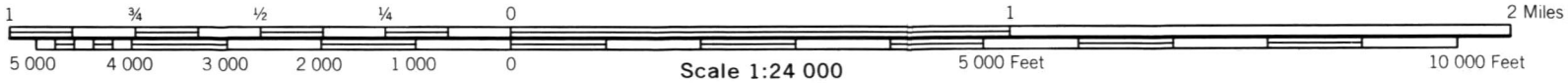
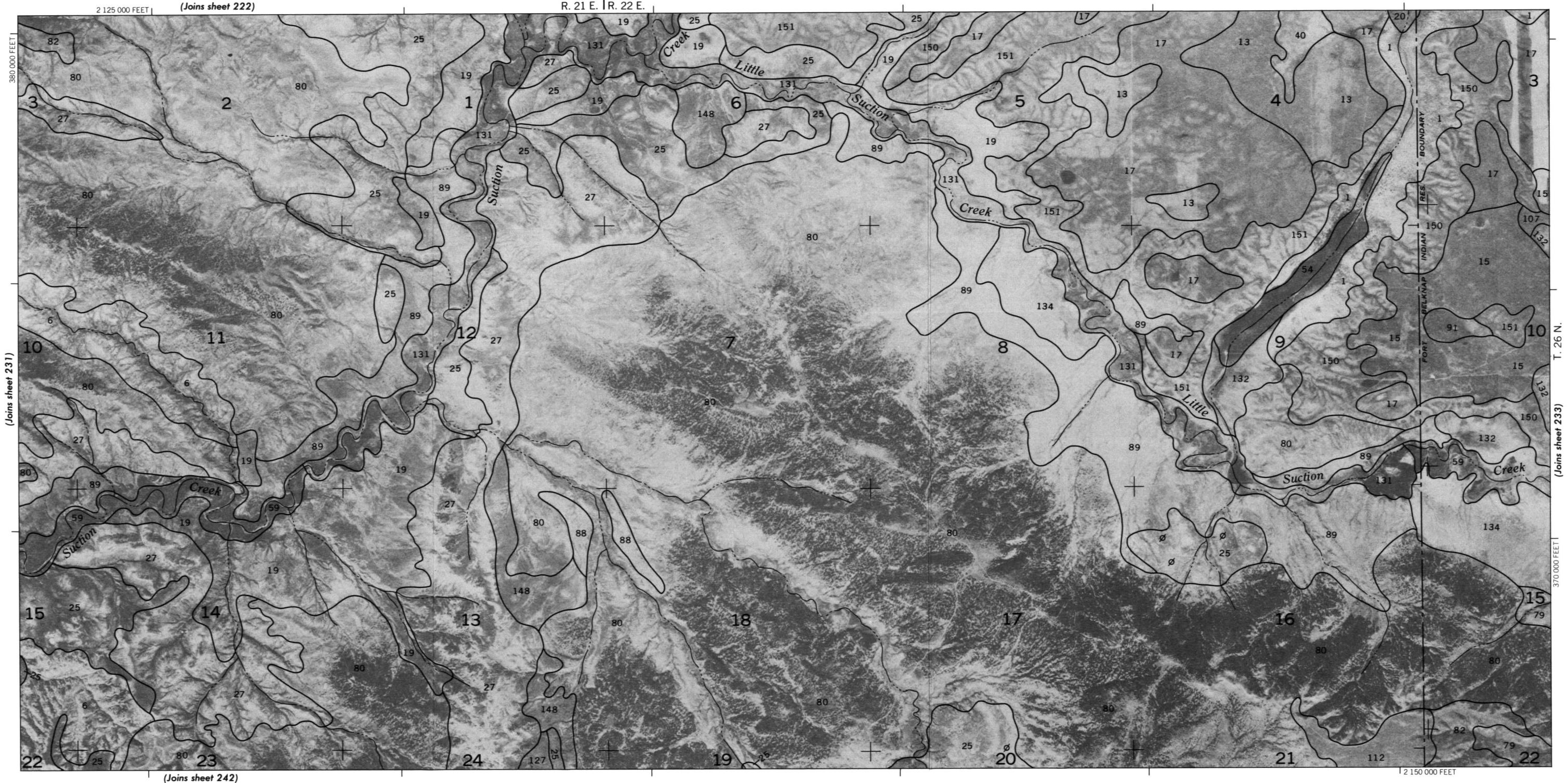
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 229





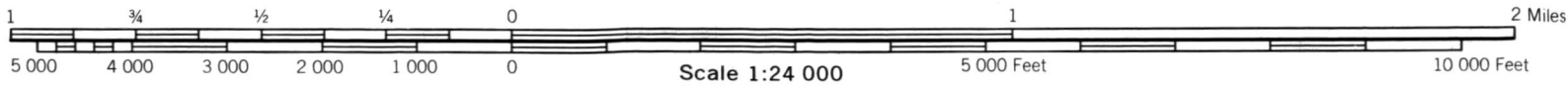
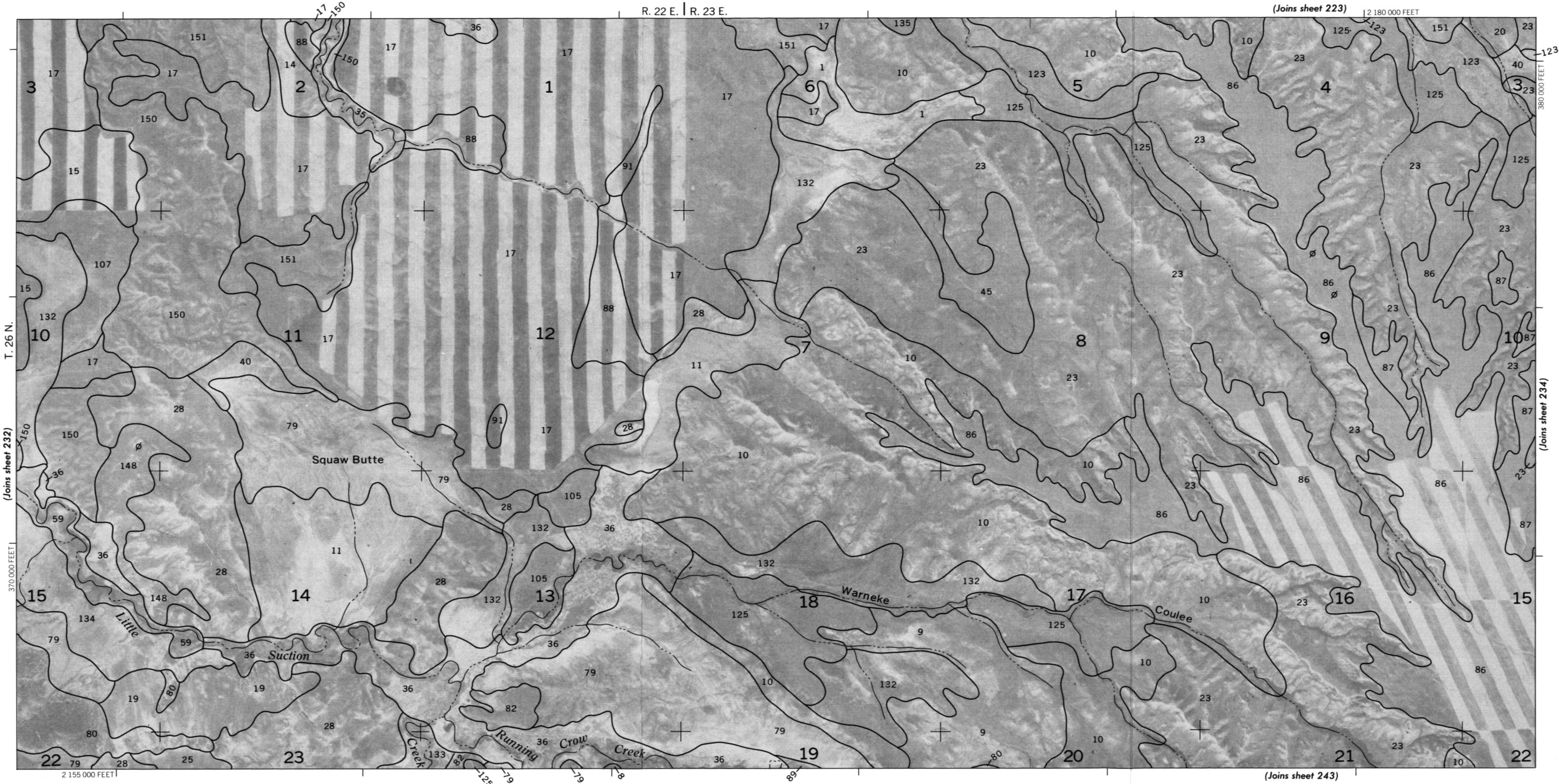
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

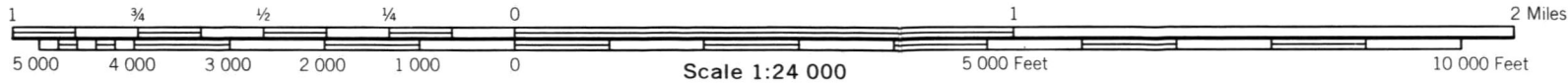
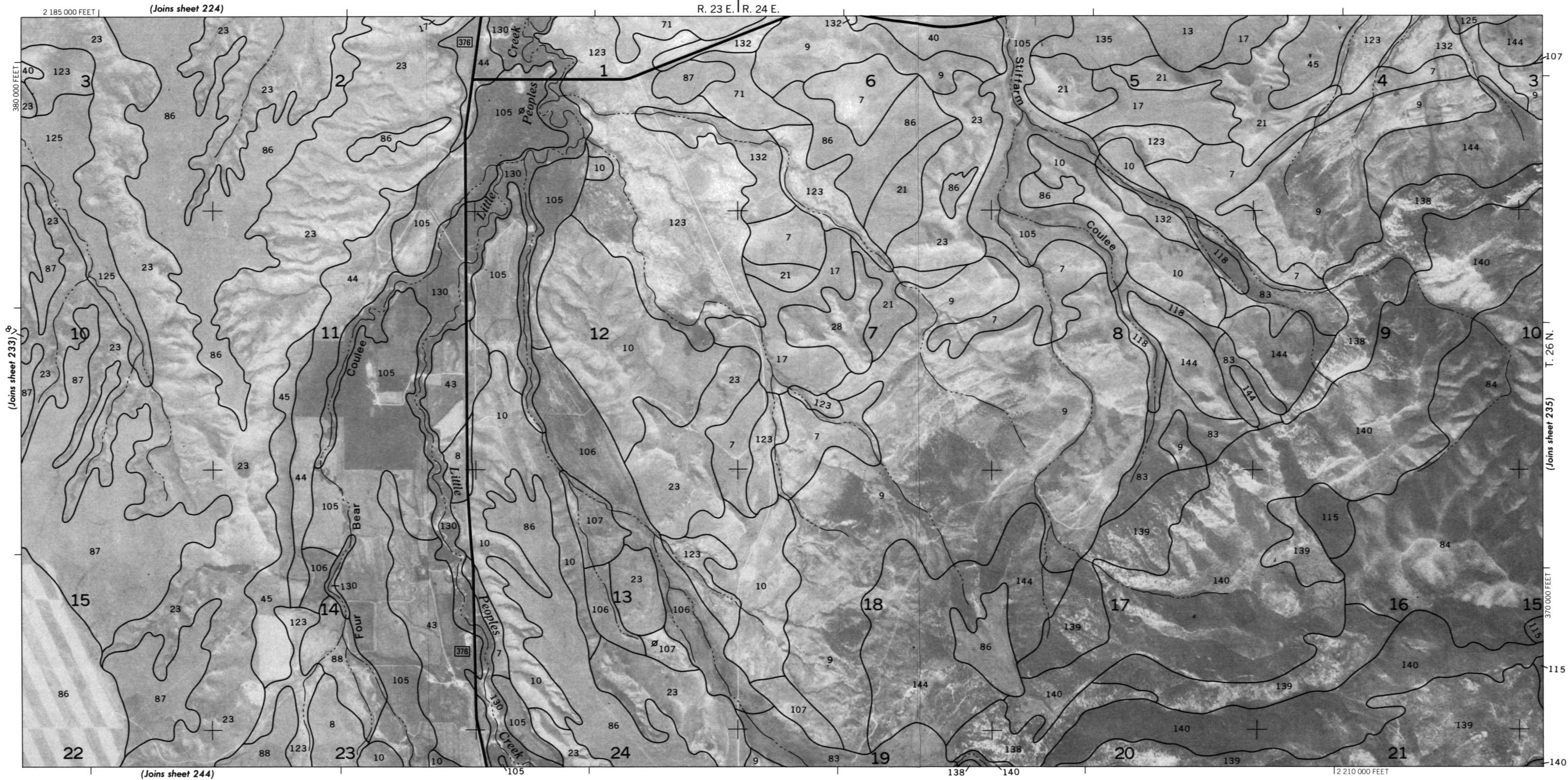


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 233

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

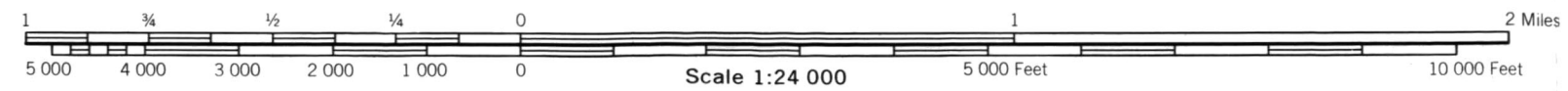
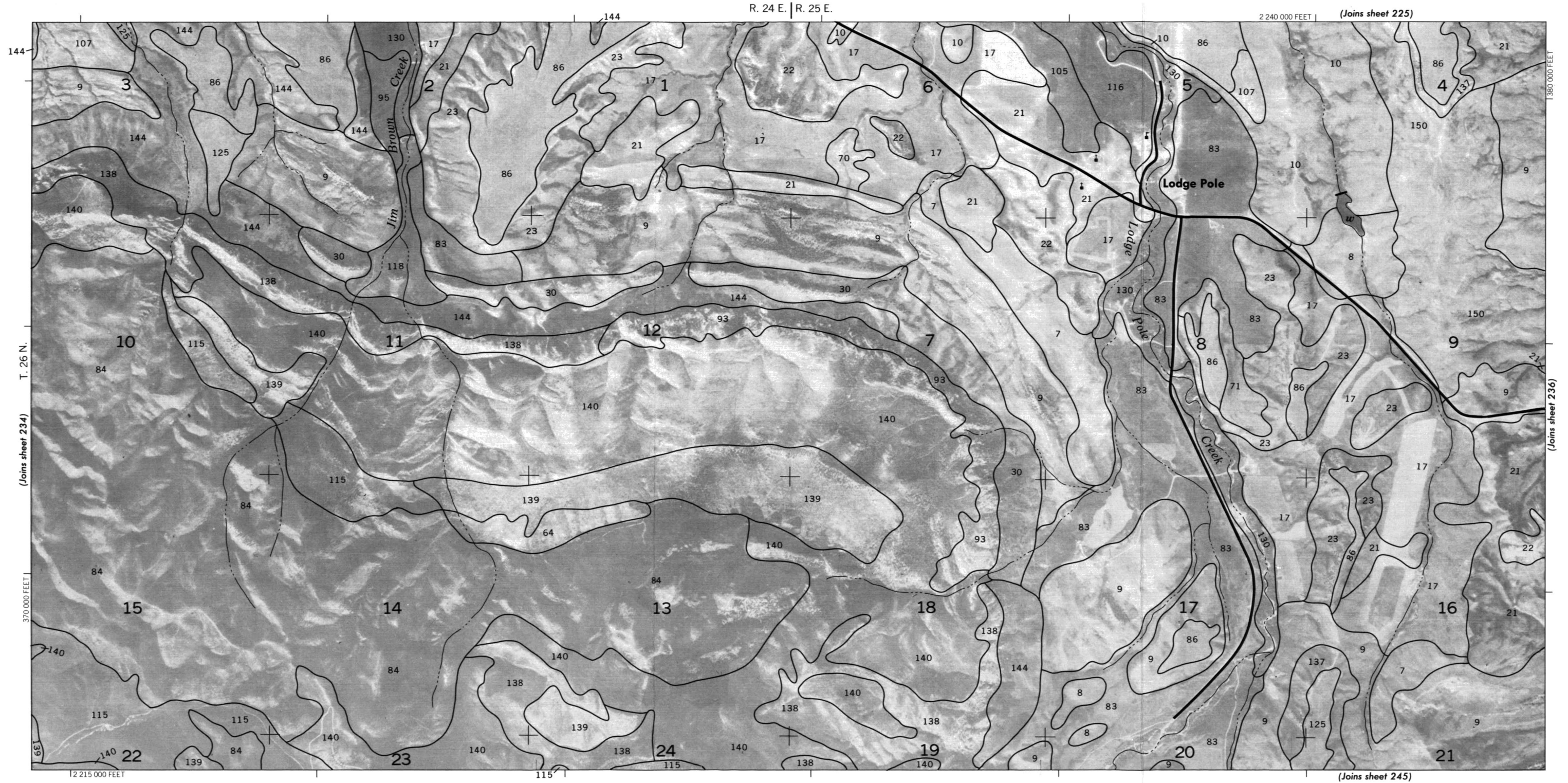


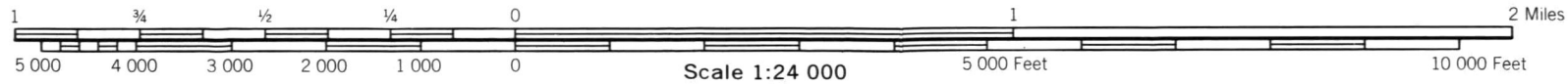
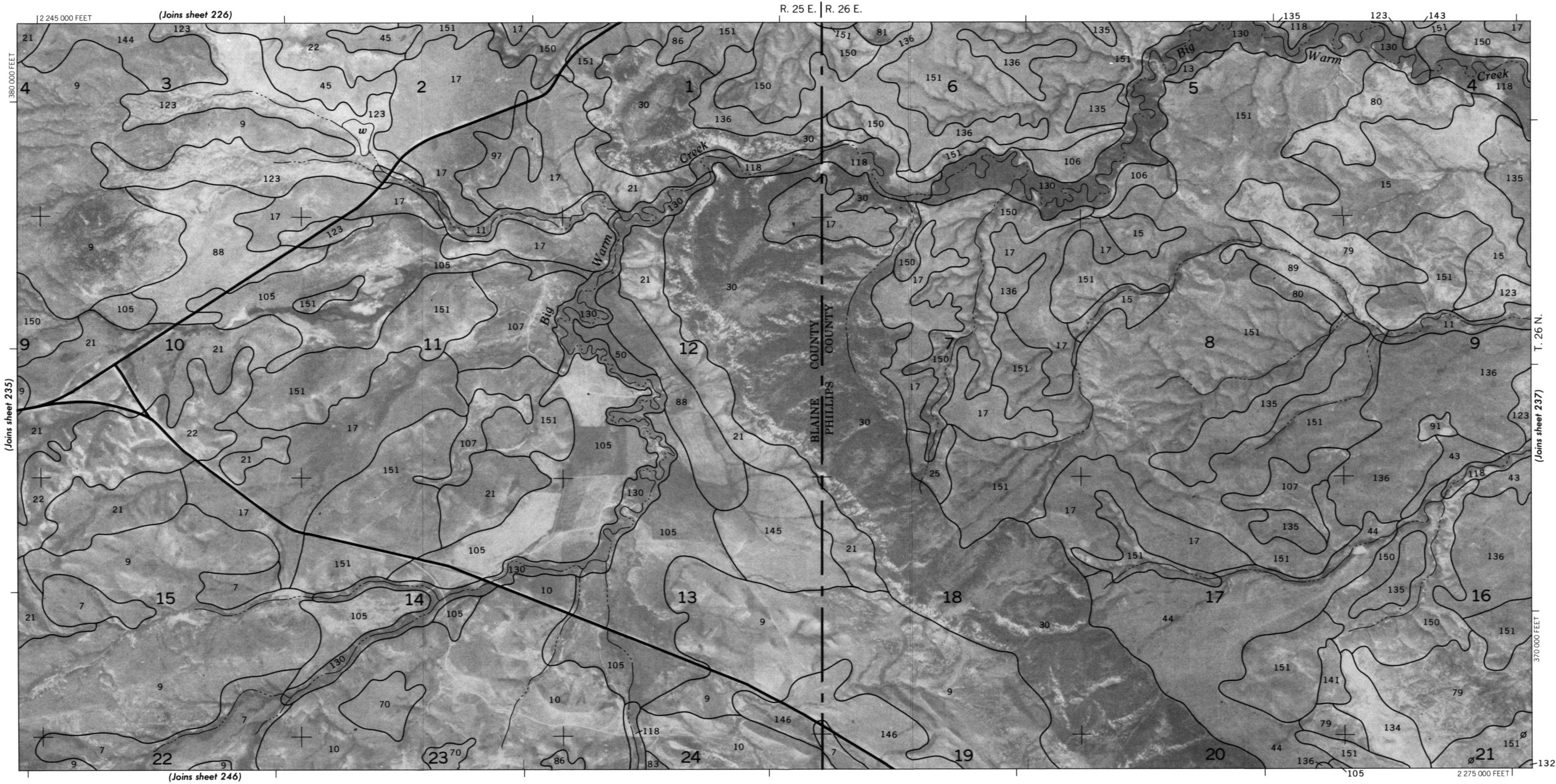


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 235

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

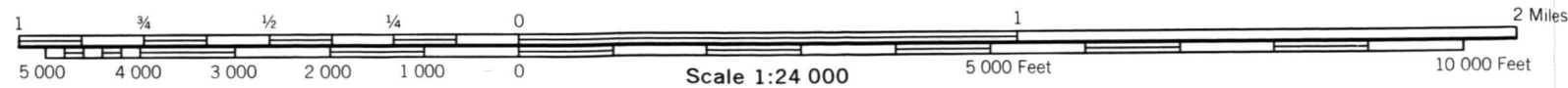
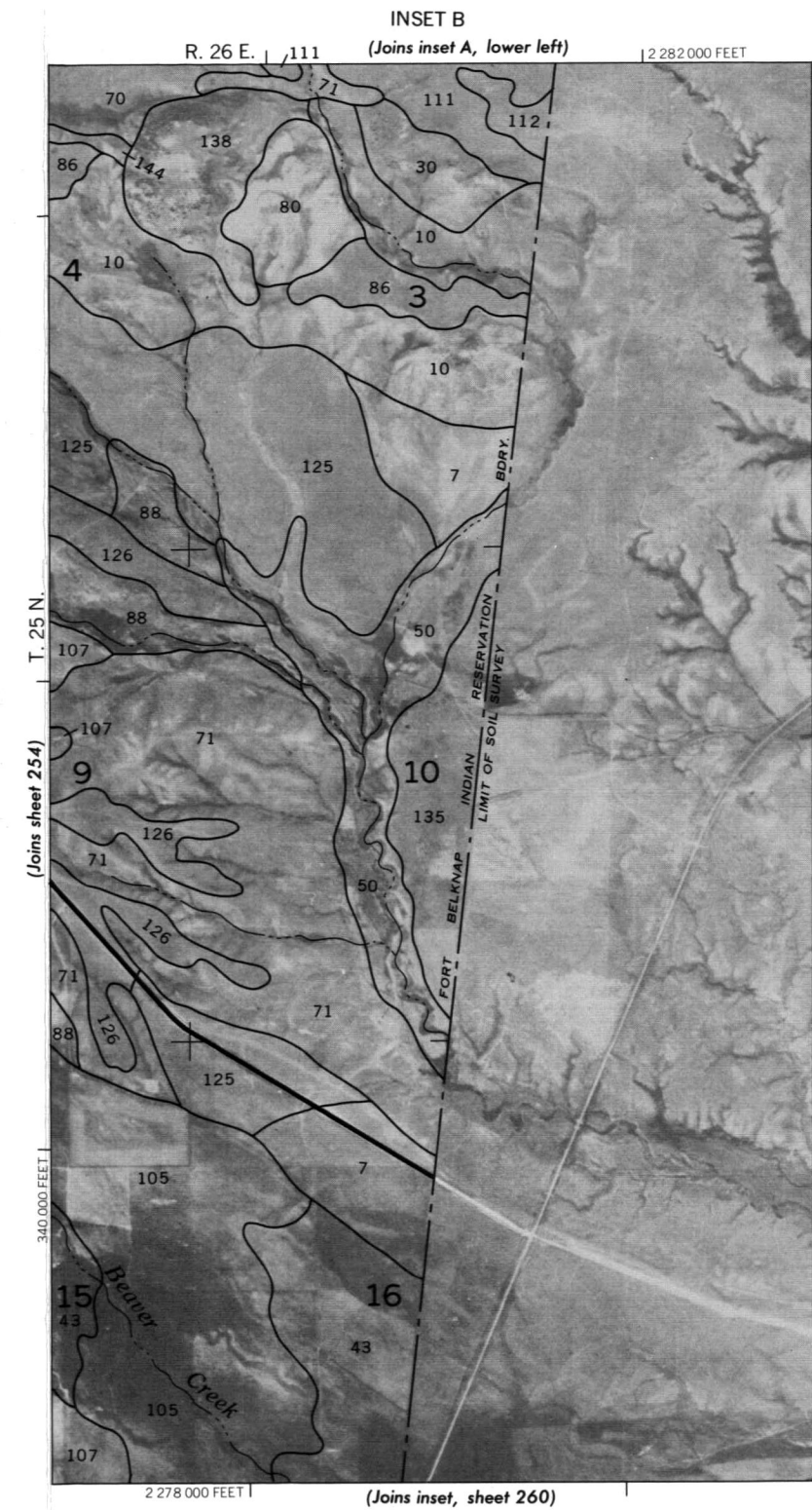
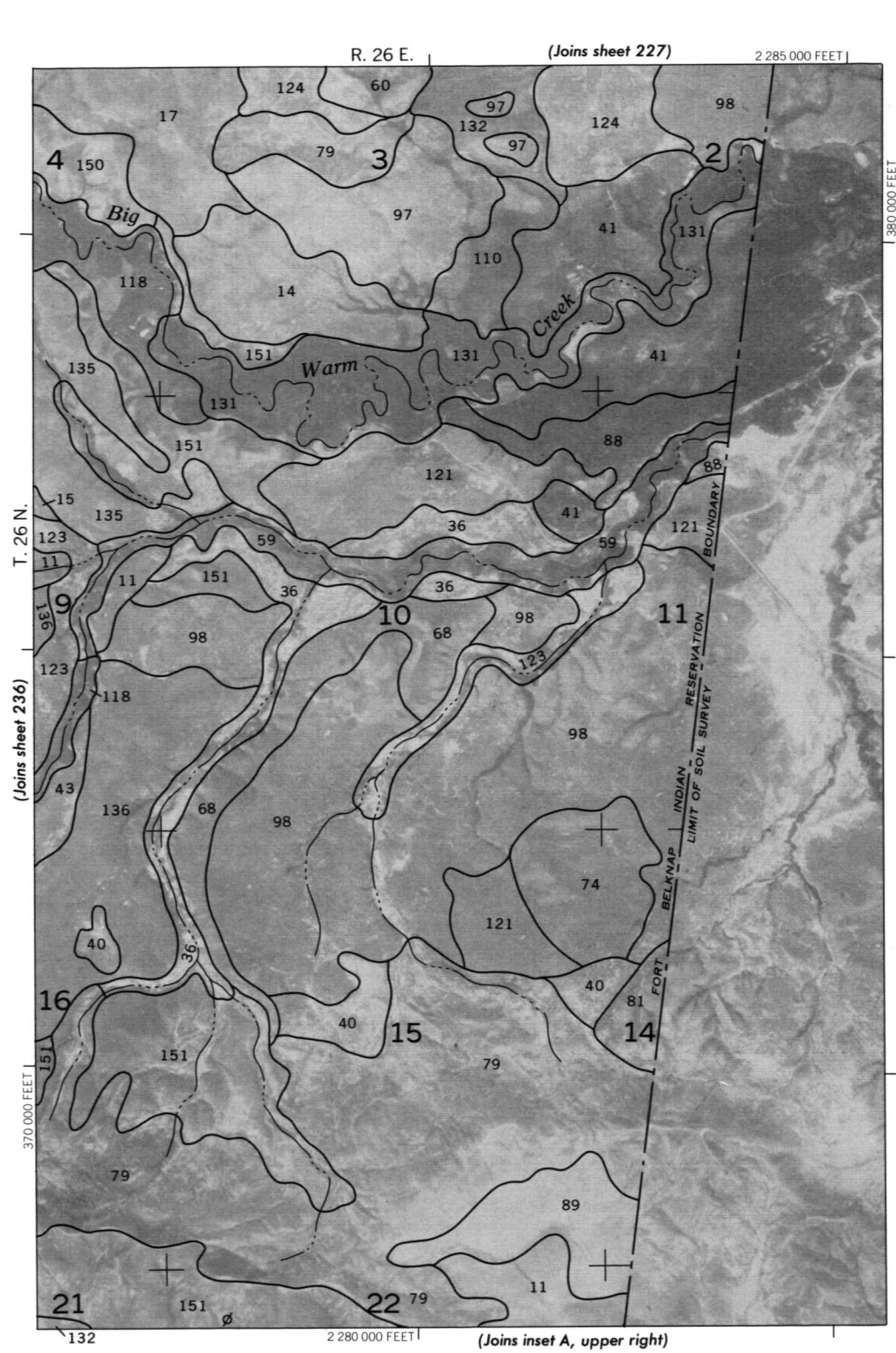




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

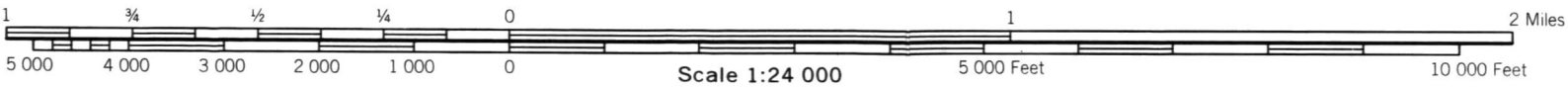
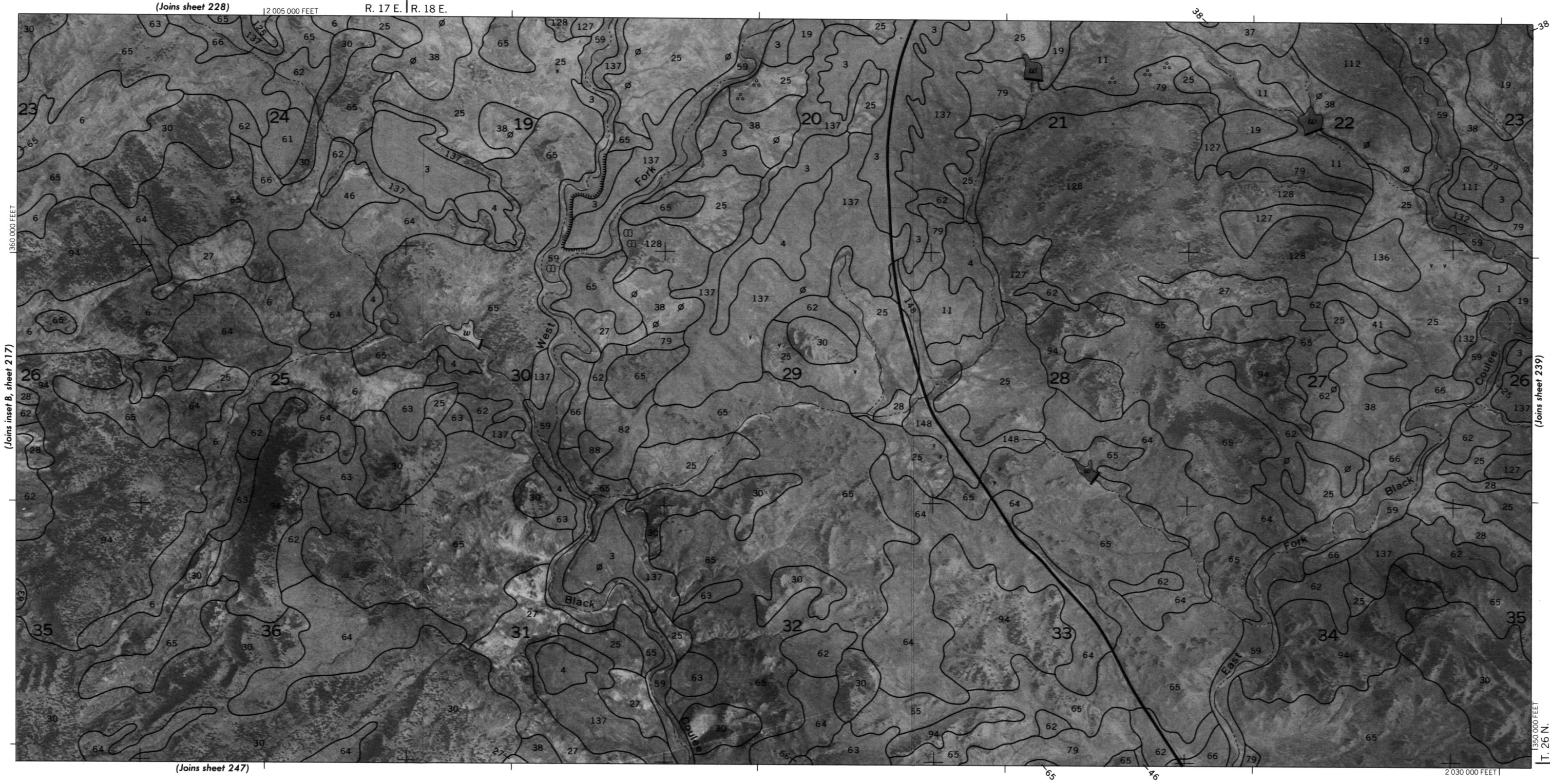
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 237



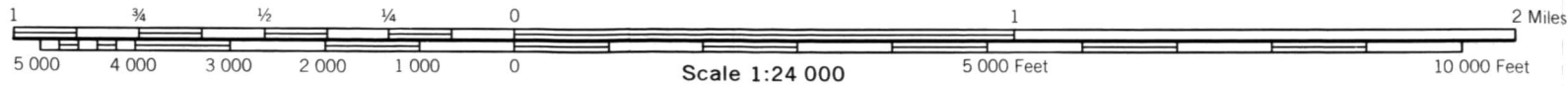


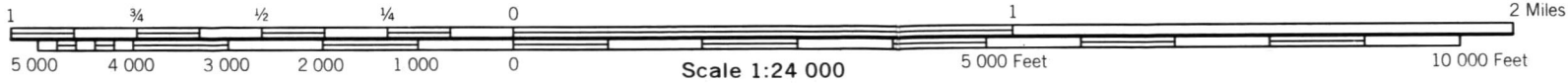
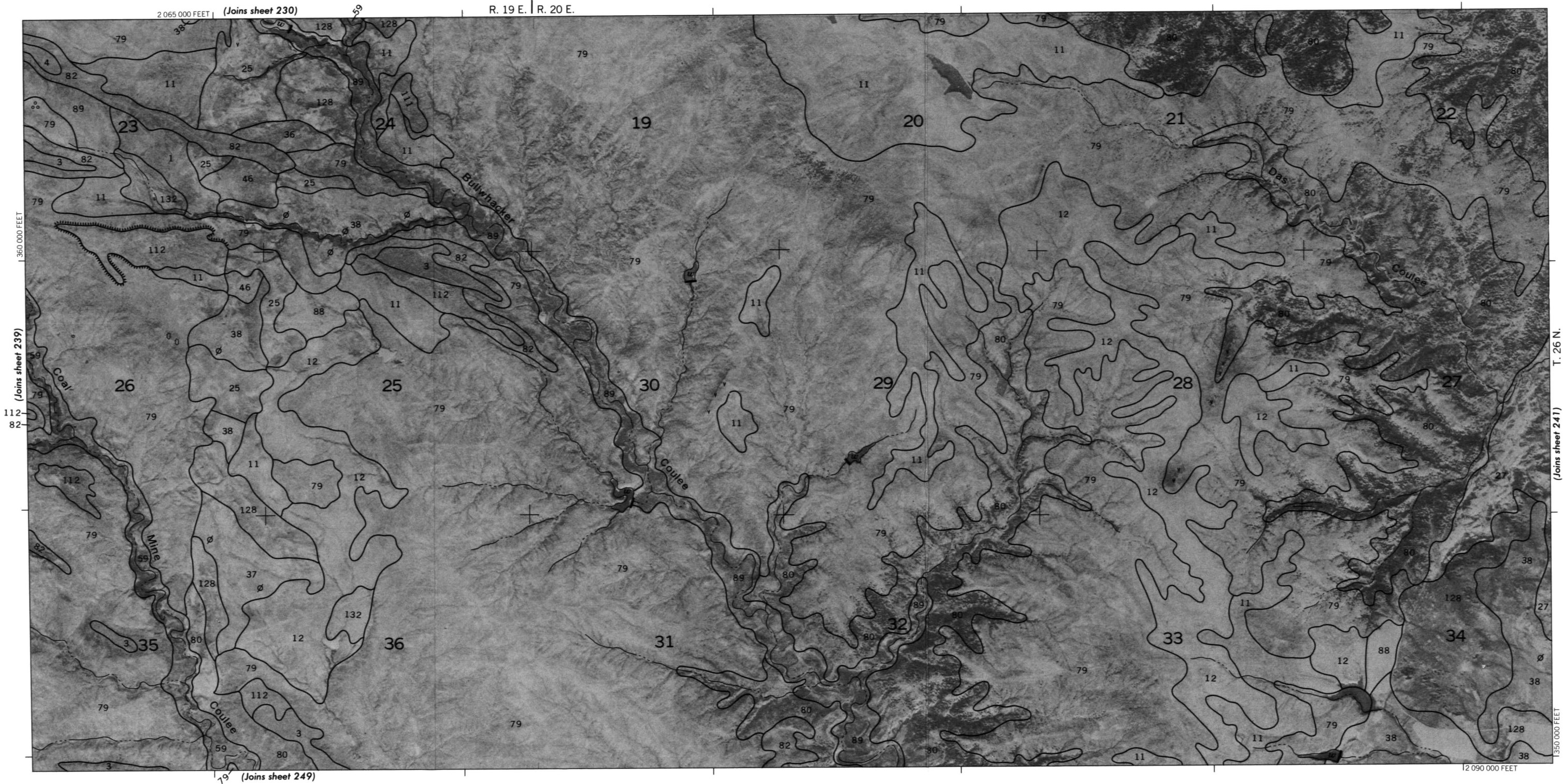
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 238



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

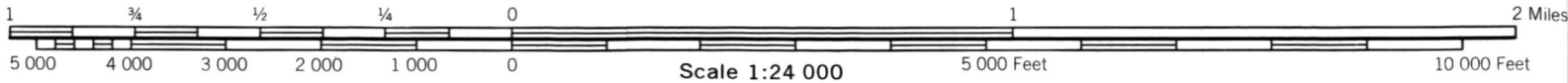
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

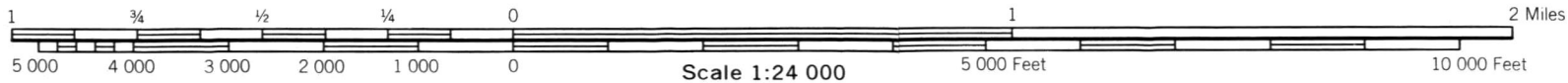
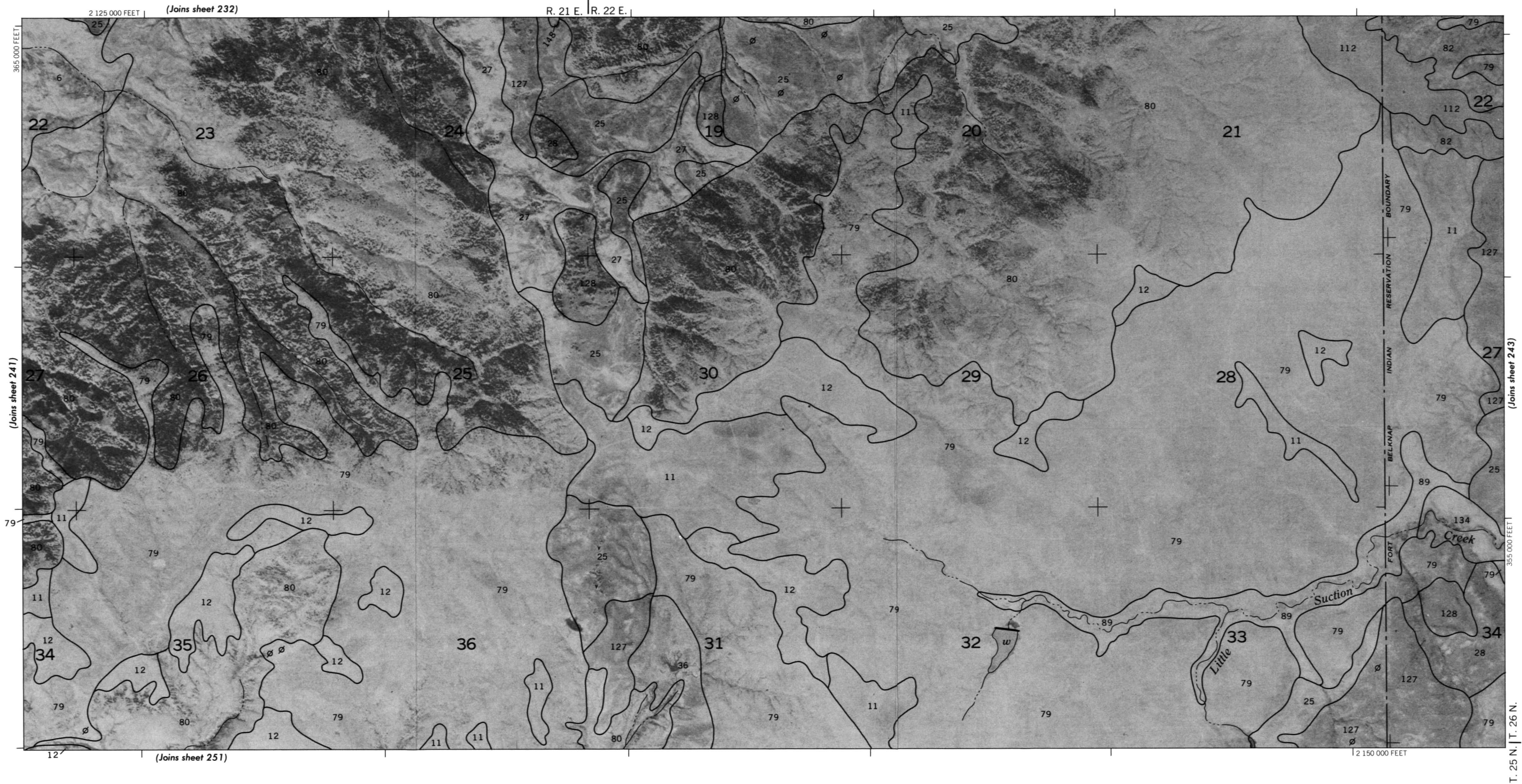




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

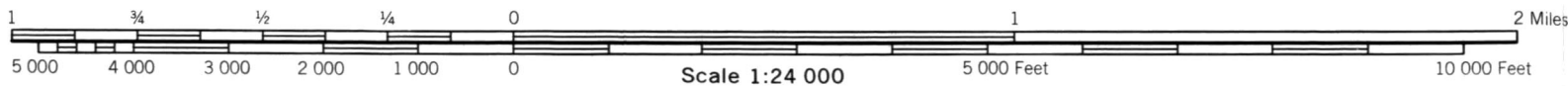
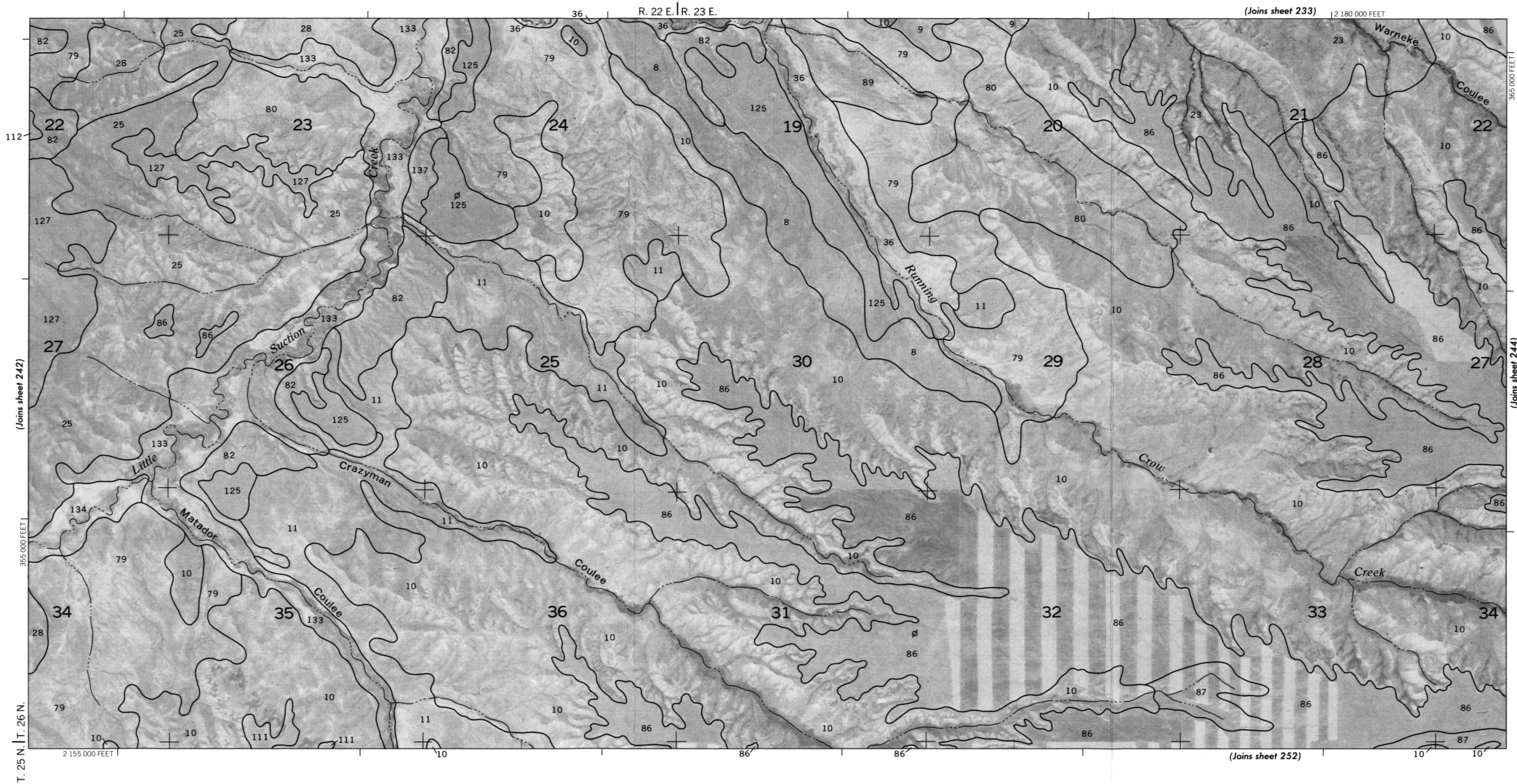




Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

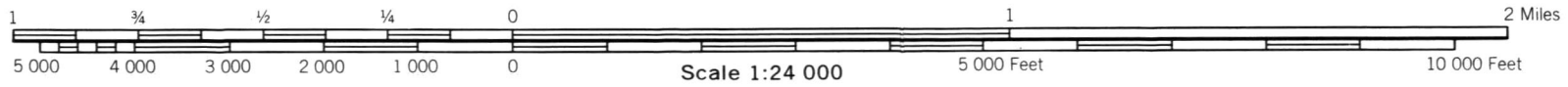
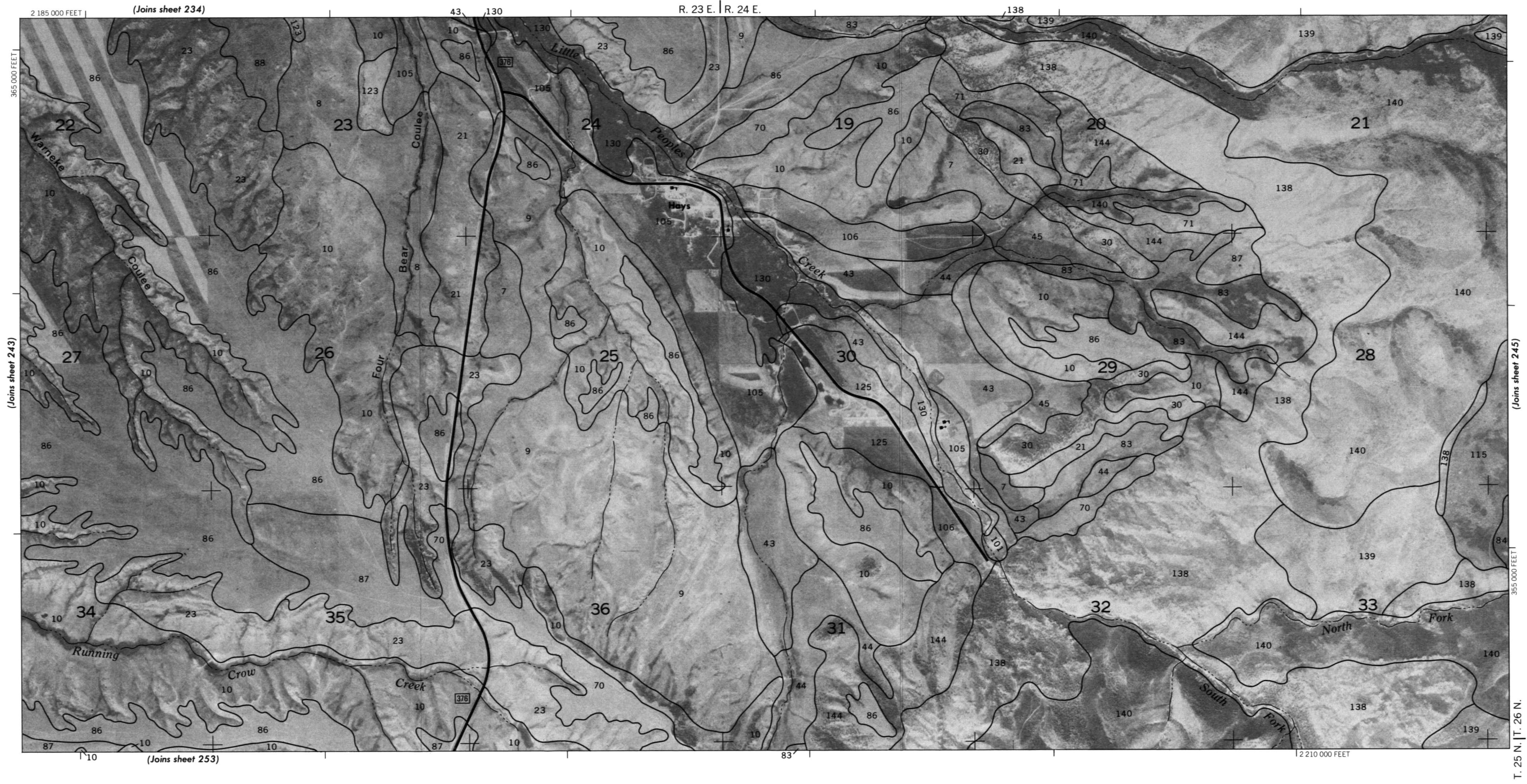
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 243

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





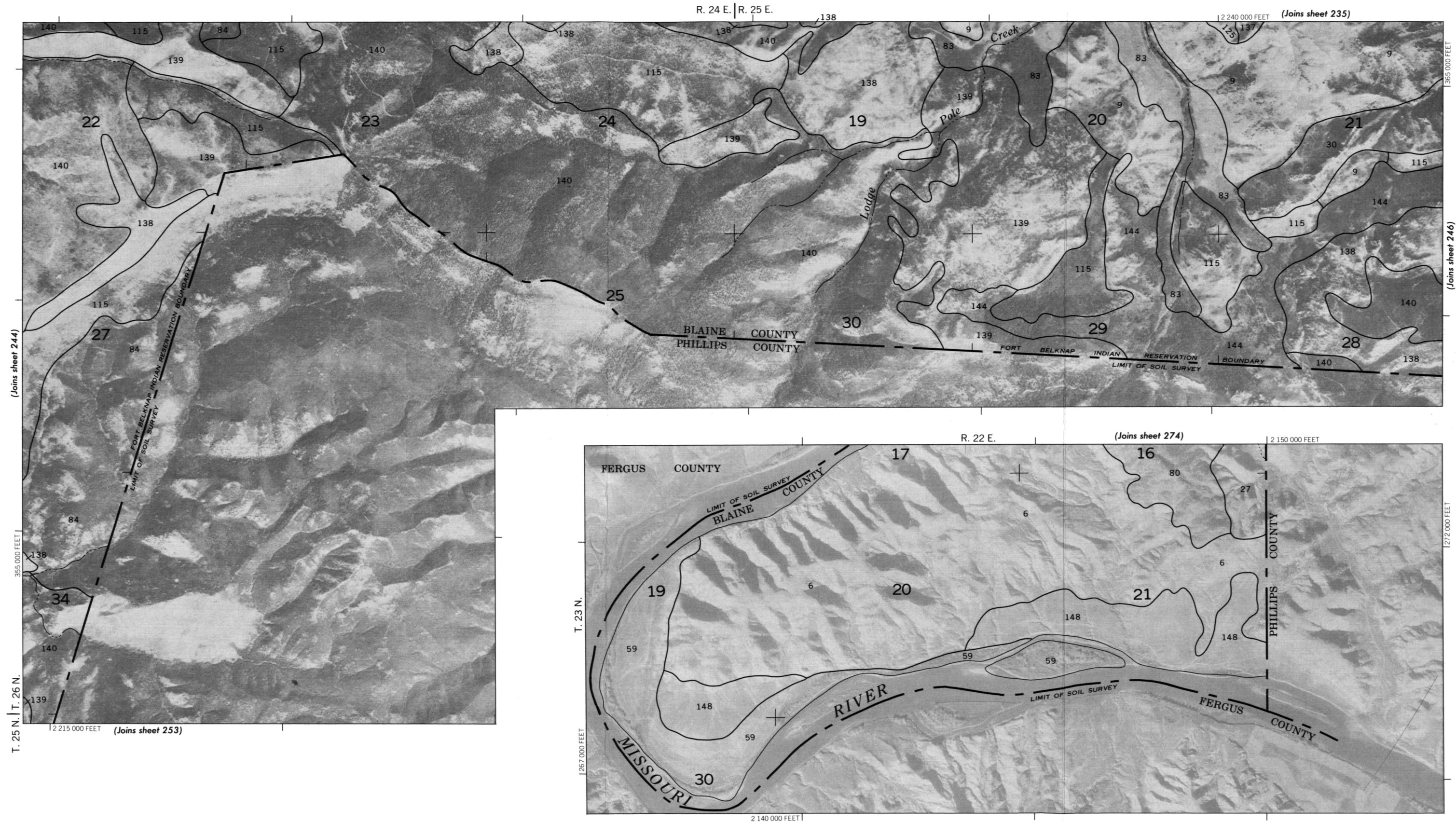
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 244

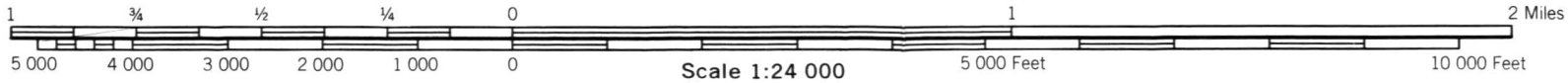
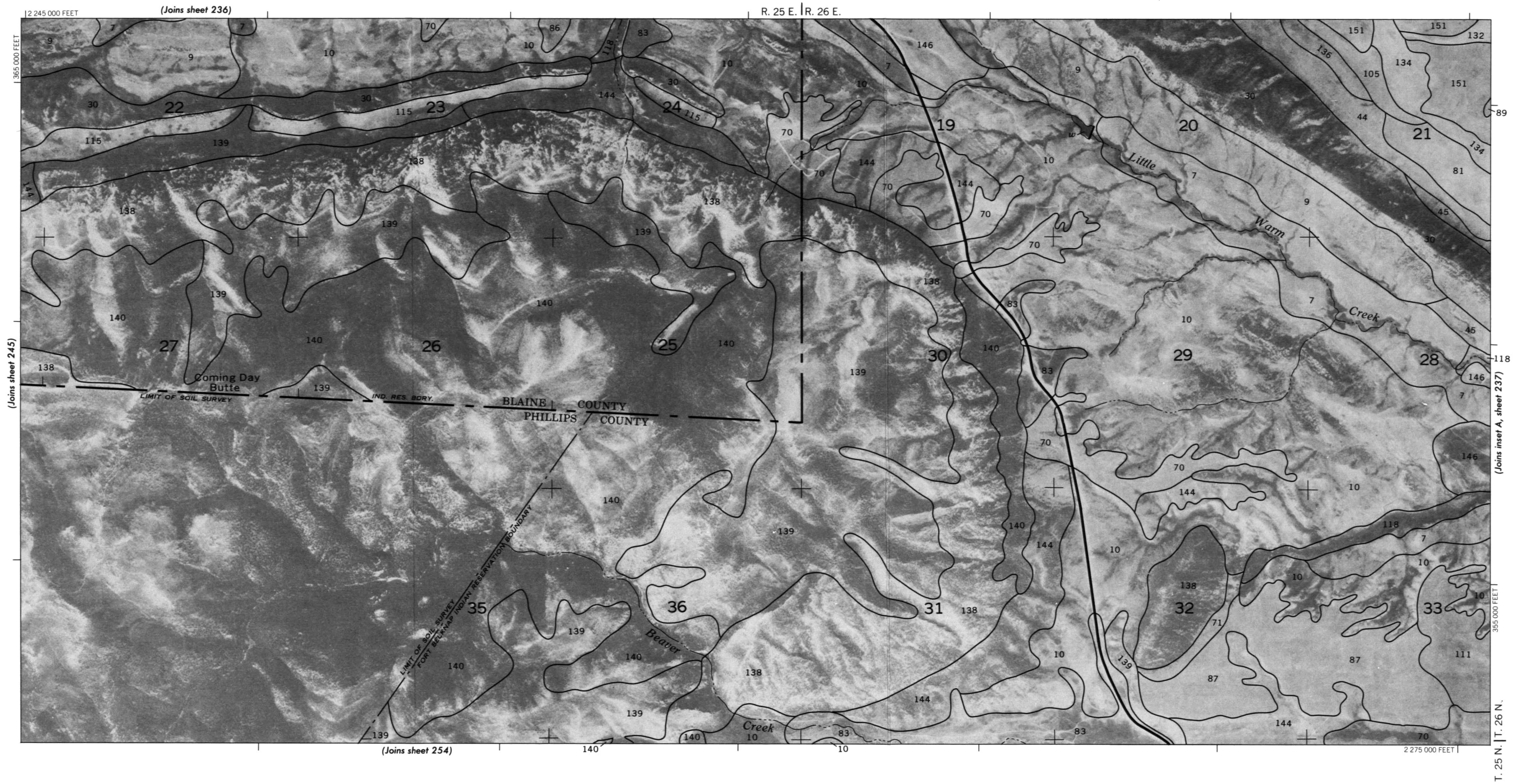


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY. MONTANA NO. 245

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

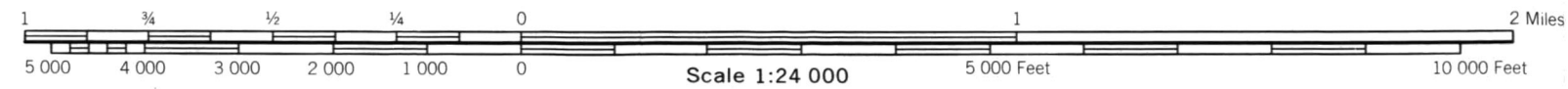
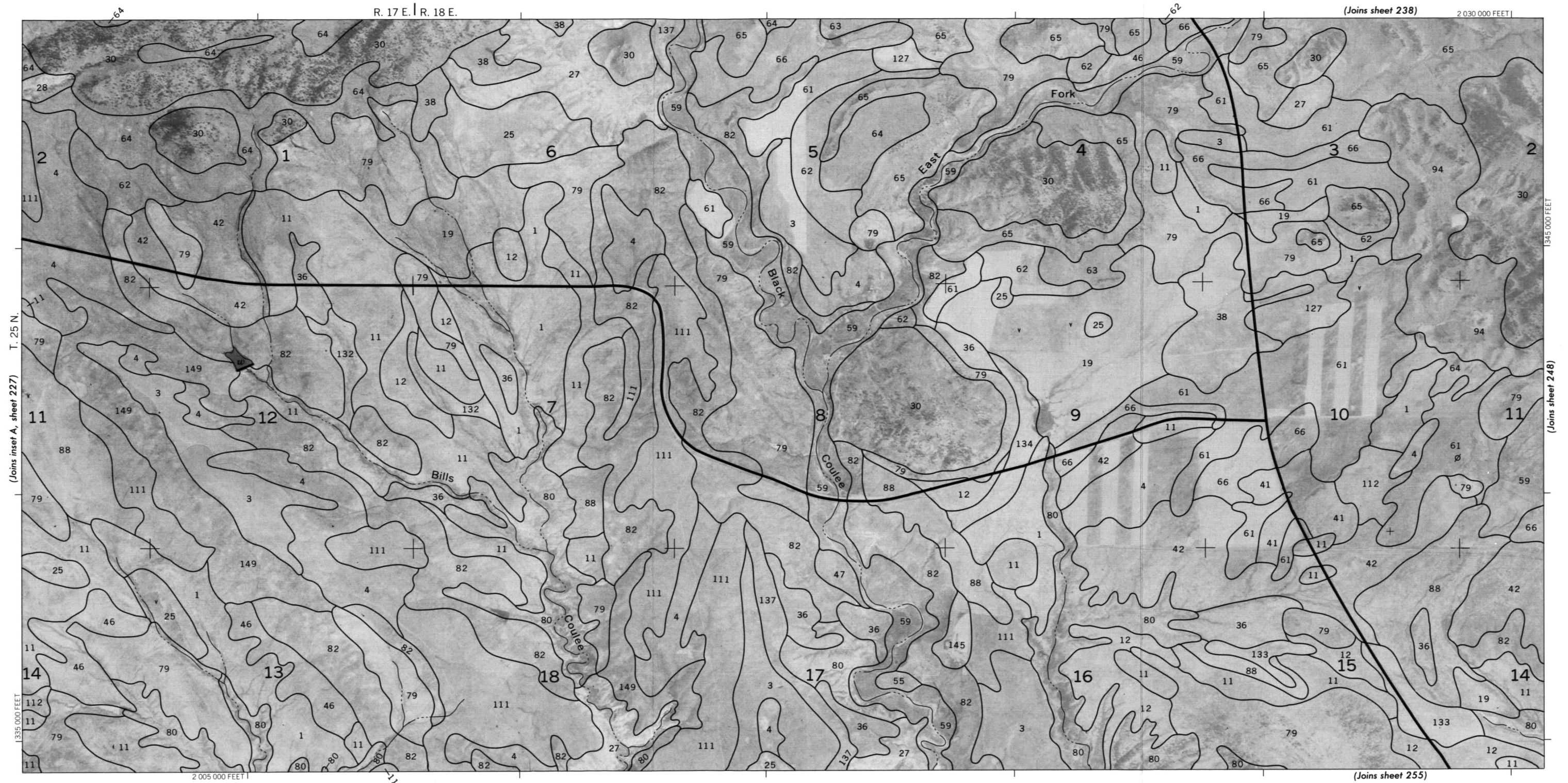


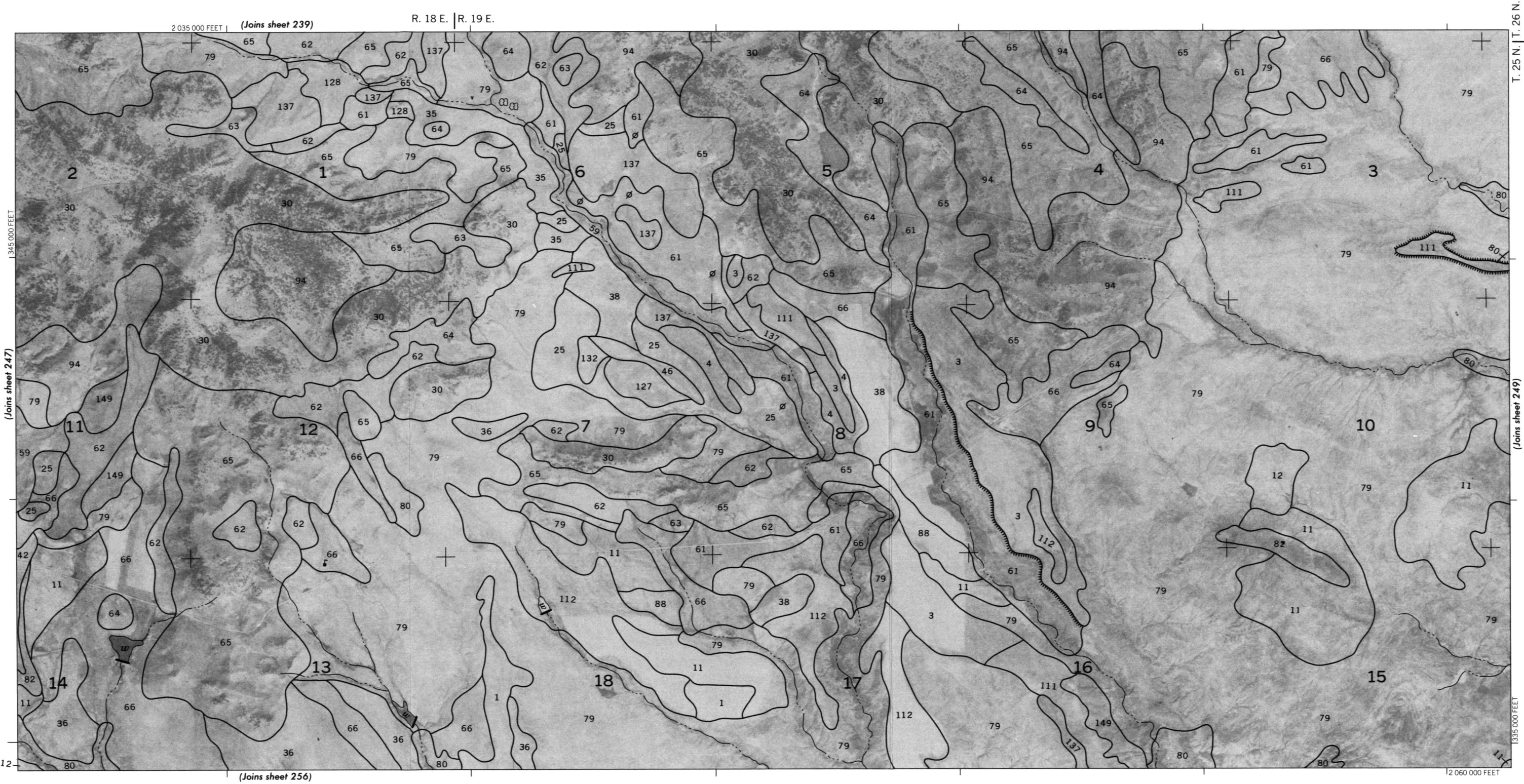


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 247

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





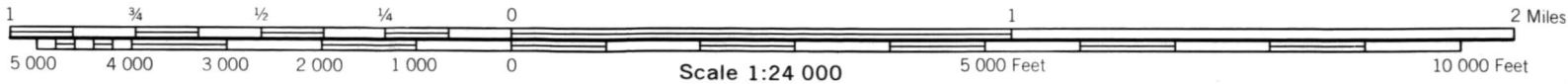
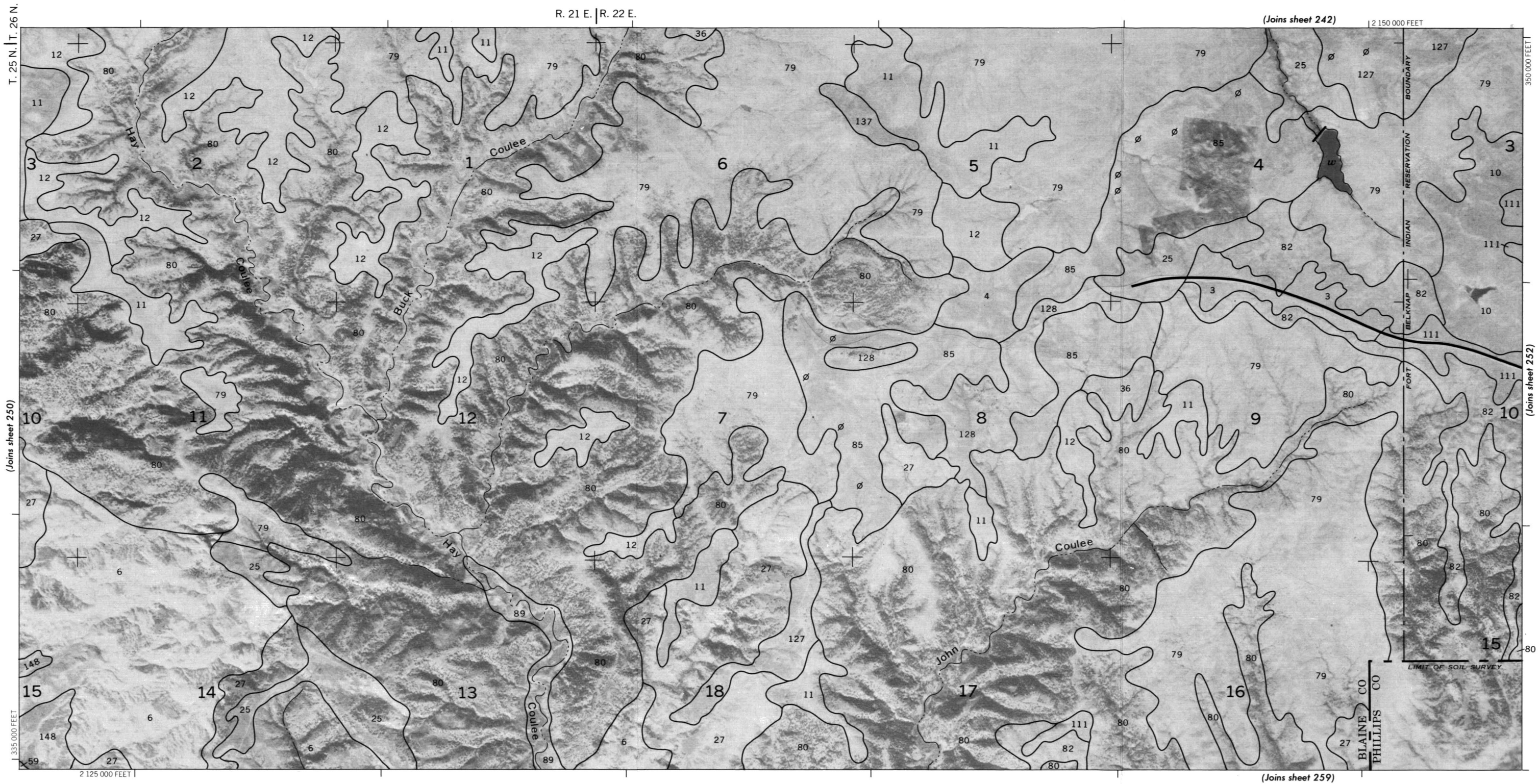
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

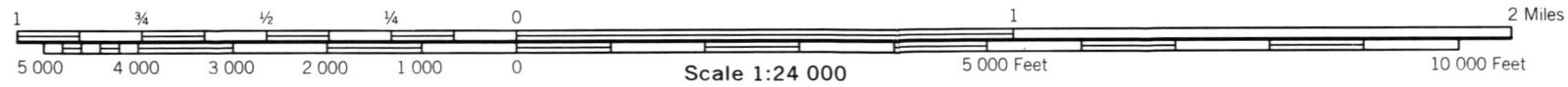
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 251

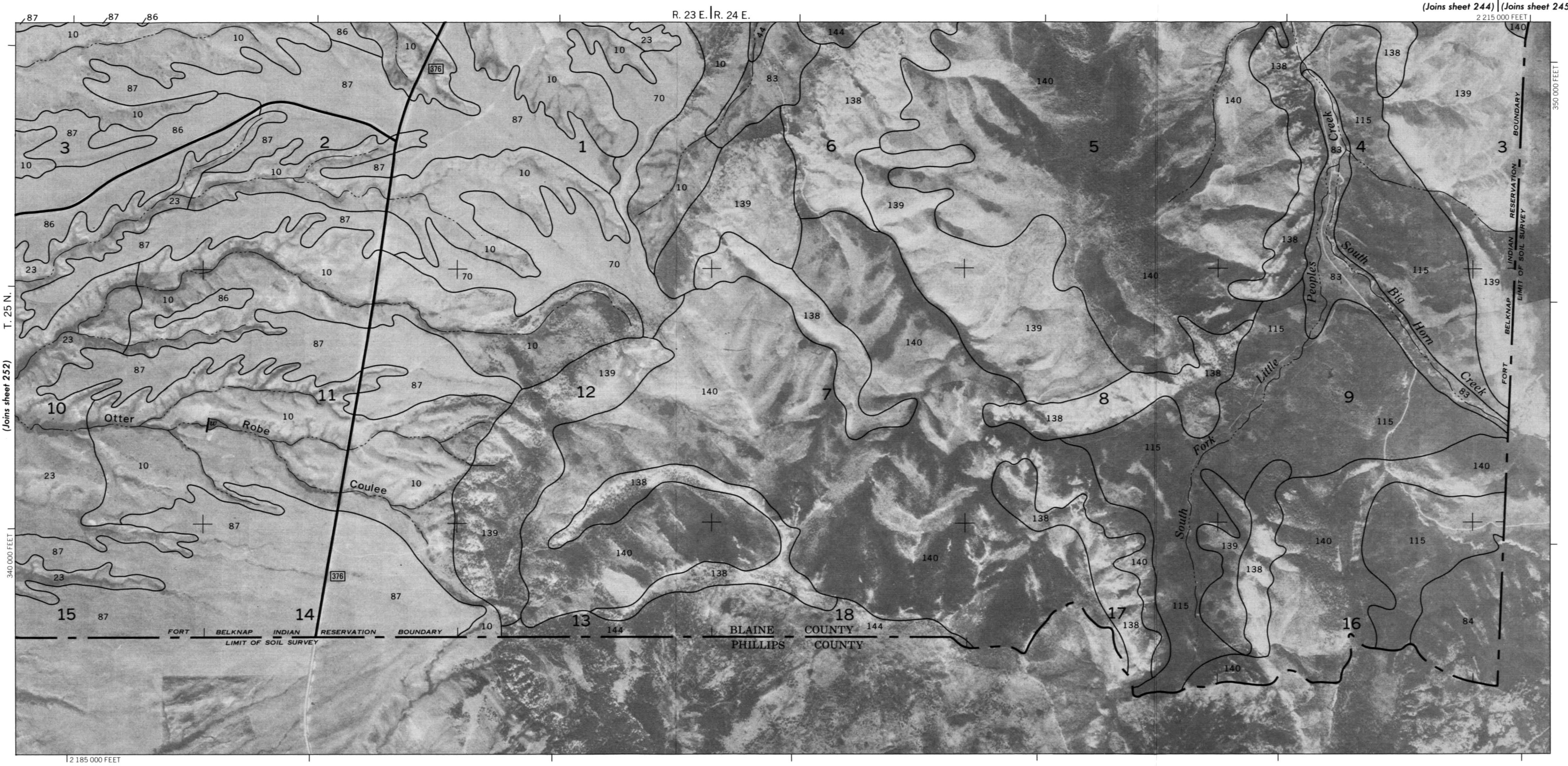




SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 252



Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



(Joins sheet 252)

(Joins sheet 244) (Joins sheet 245)

T. 25 N.

R. 23 E. | R. 24 E.

340 000 FEET

350 000 FEET

2 185 000 FEET

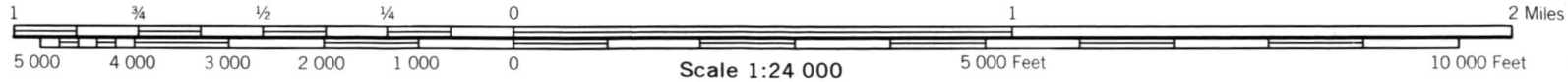
2 215 000 FEET

FORT BELKNAP INDIAN RESERVATION
LIMIT OF SOIL SURVEY

BLAINE COUNTY
PHILLIPS COUNTY

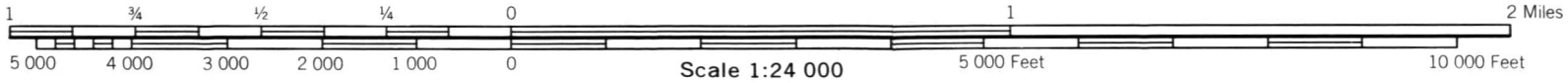
INDIAN RESERVATION
LIMIT OF SOIL SURVEY

FORT



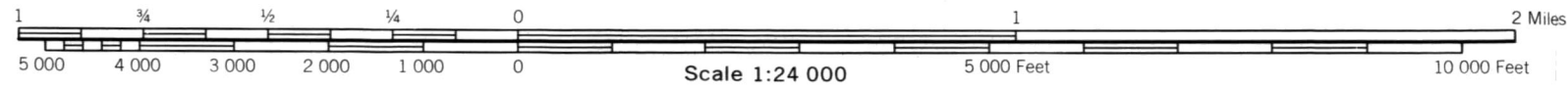
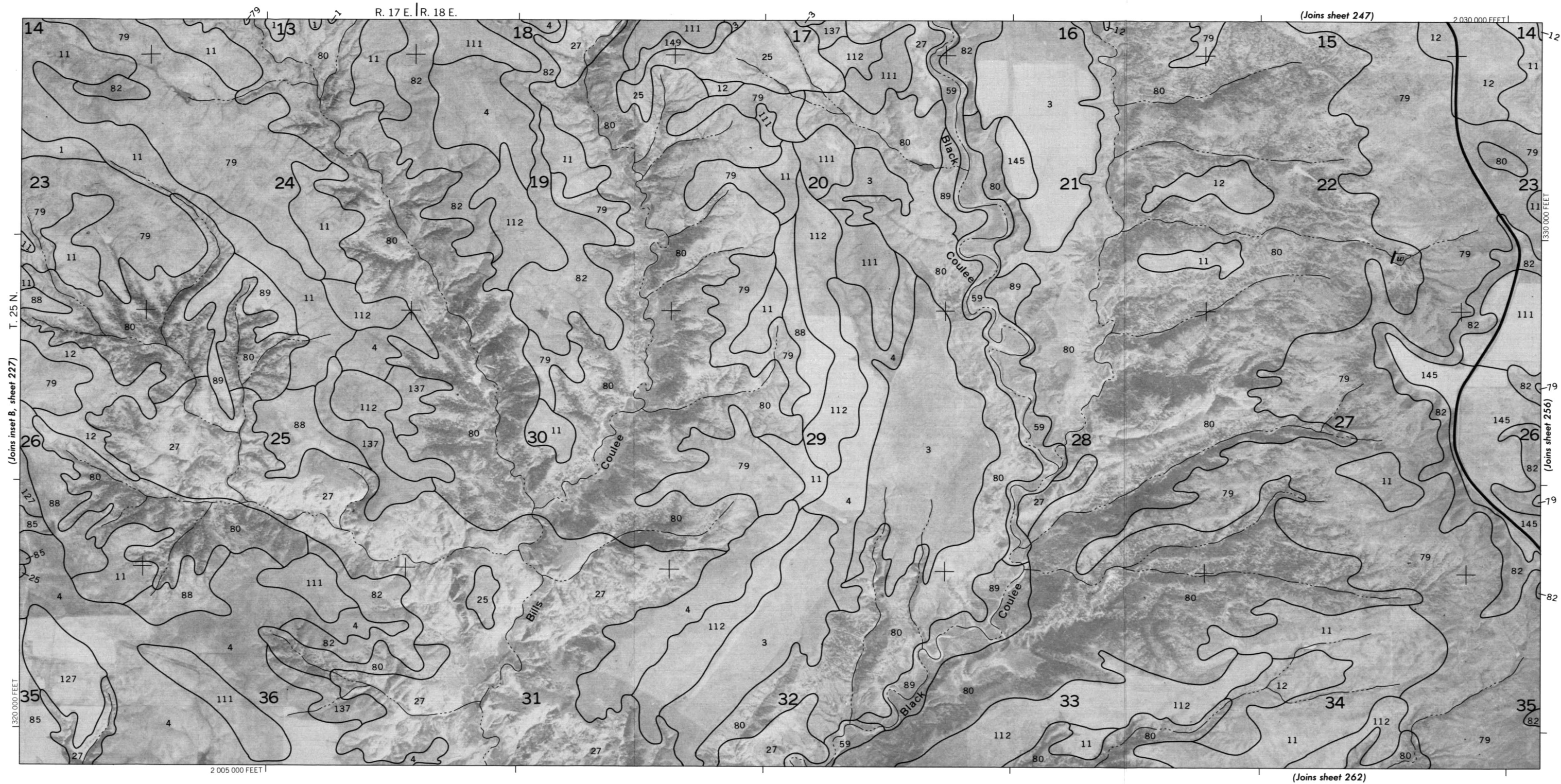
BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 253

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



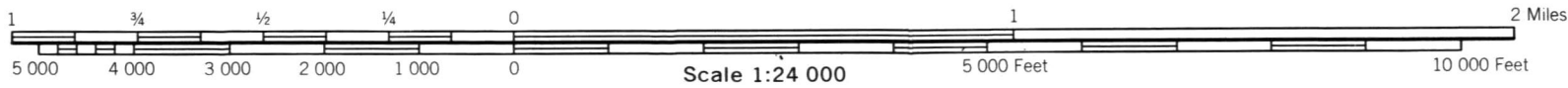
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





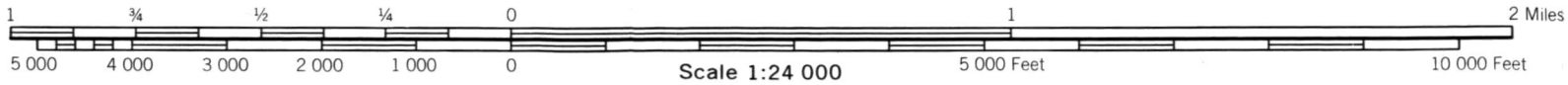
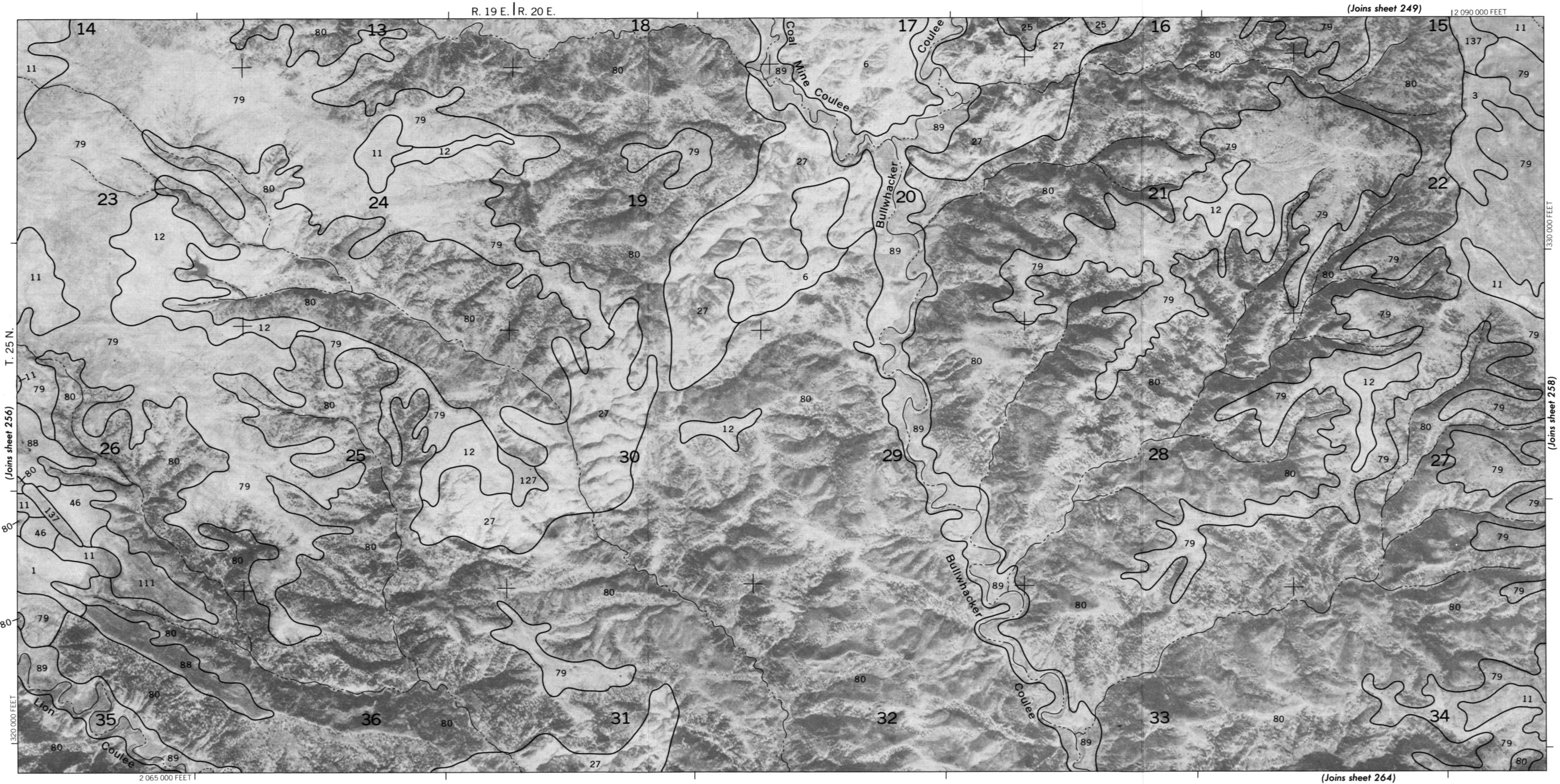
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 256

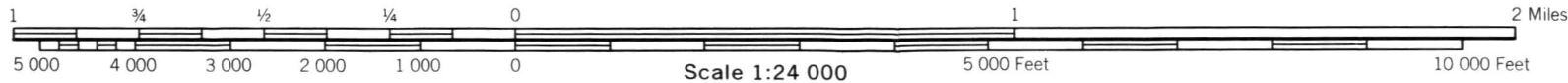


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 257

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

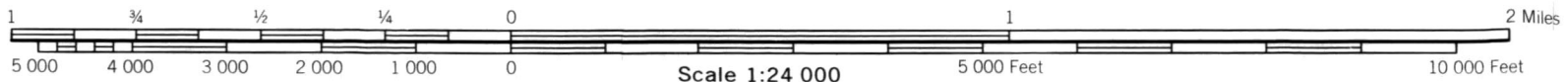
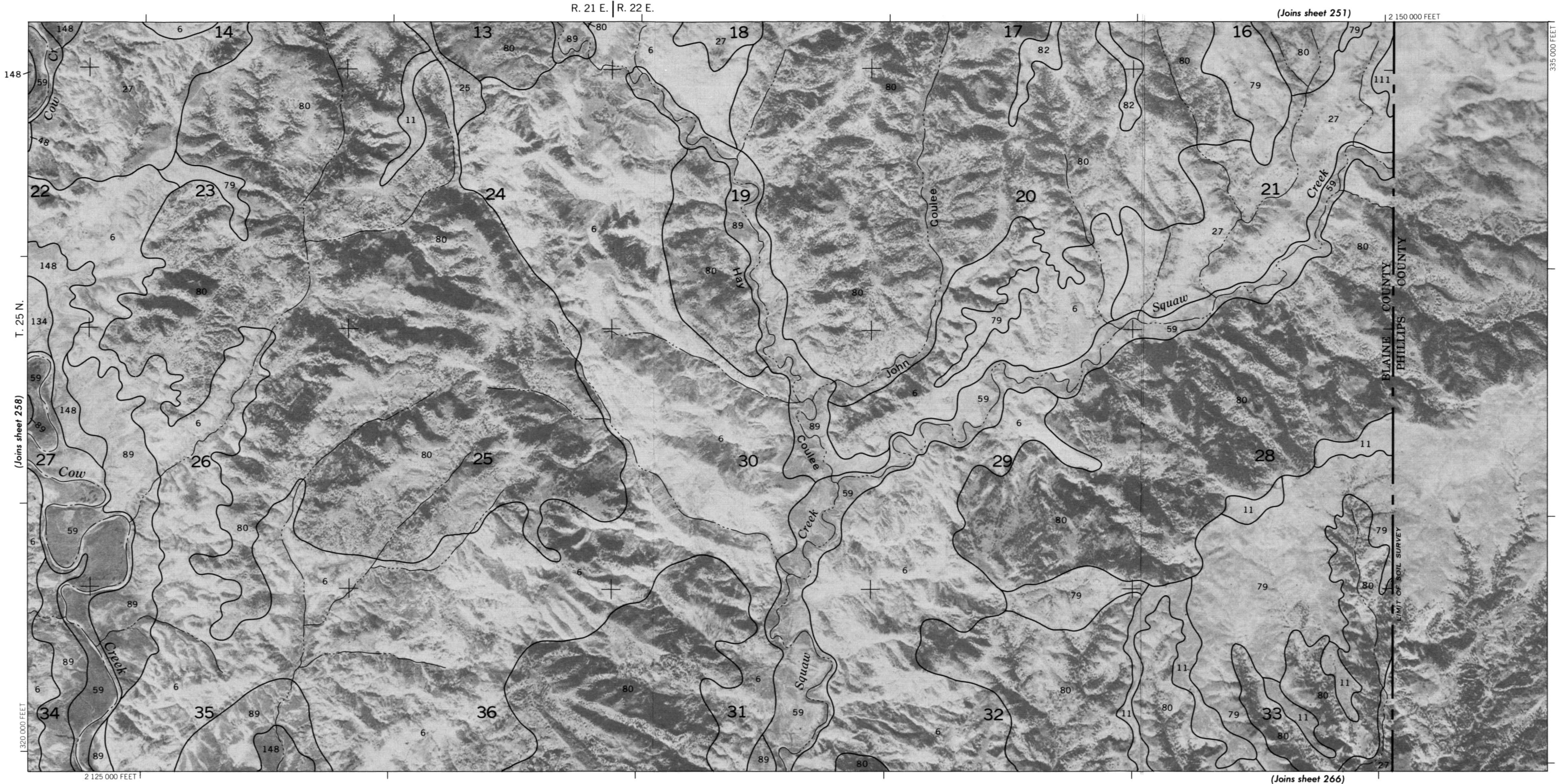


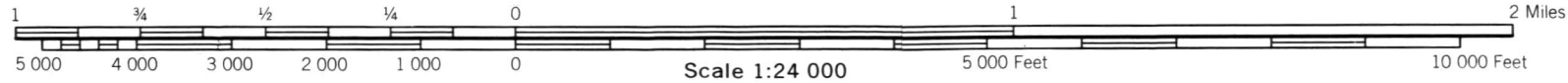
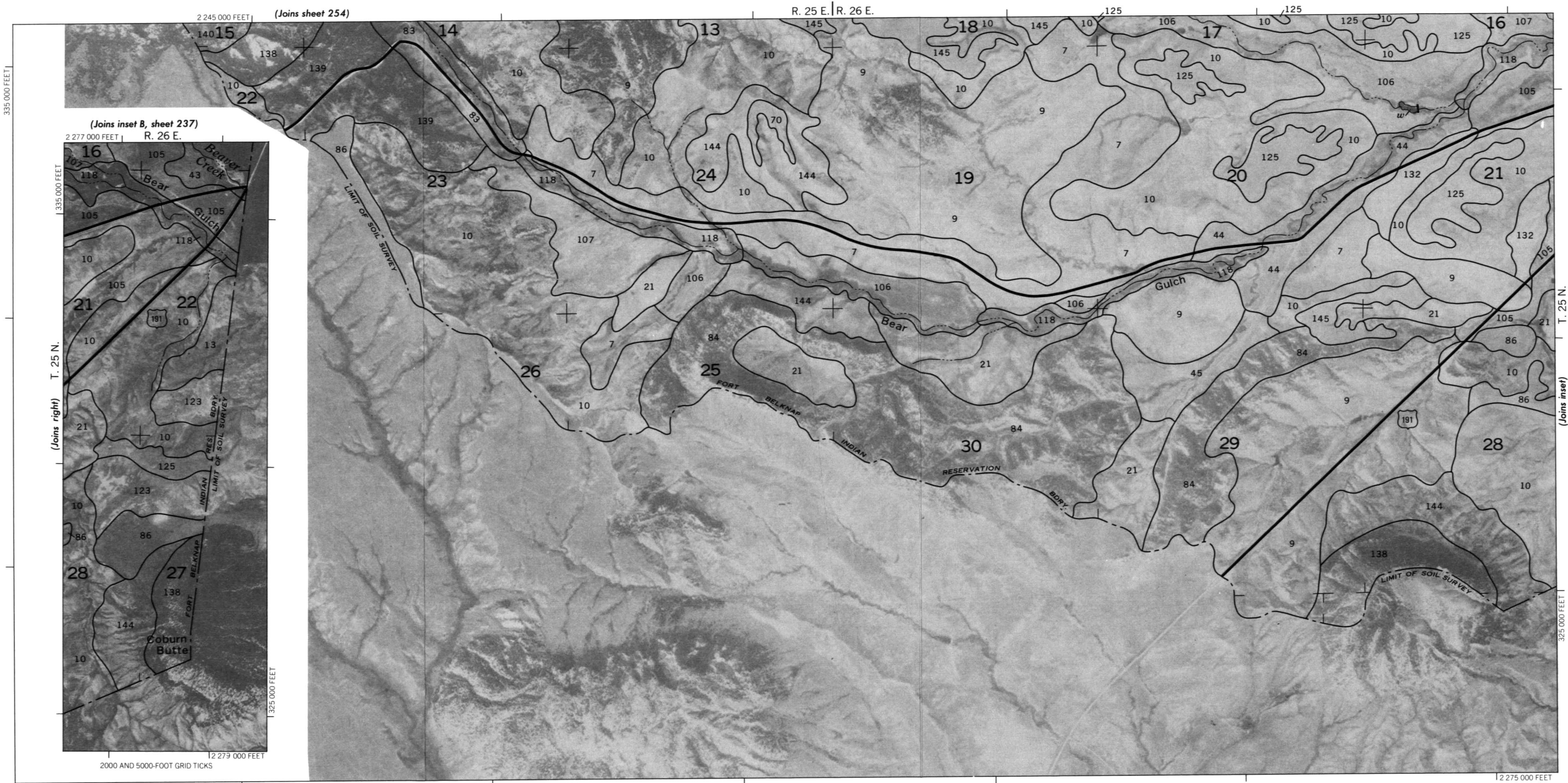


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 259

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

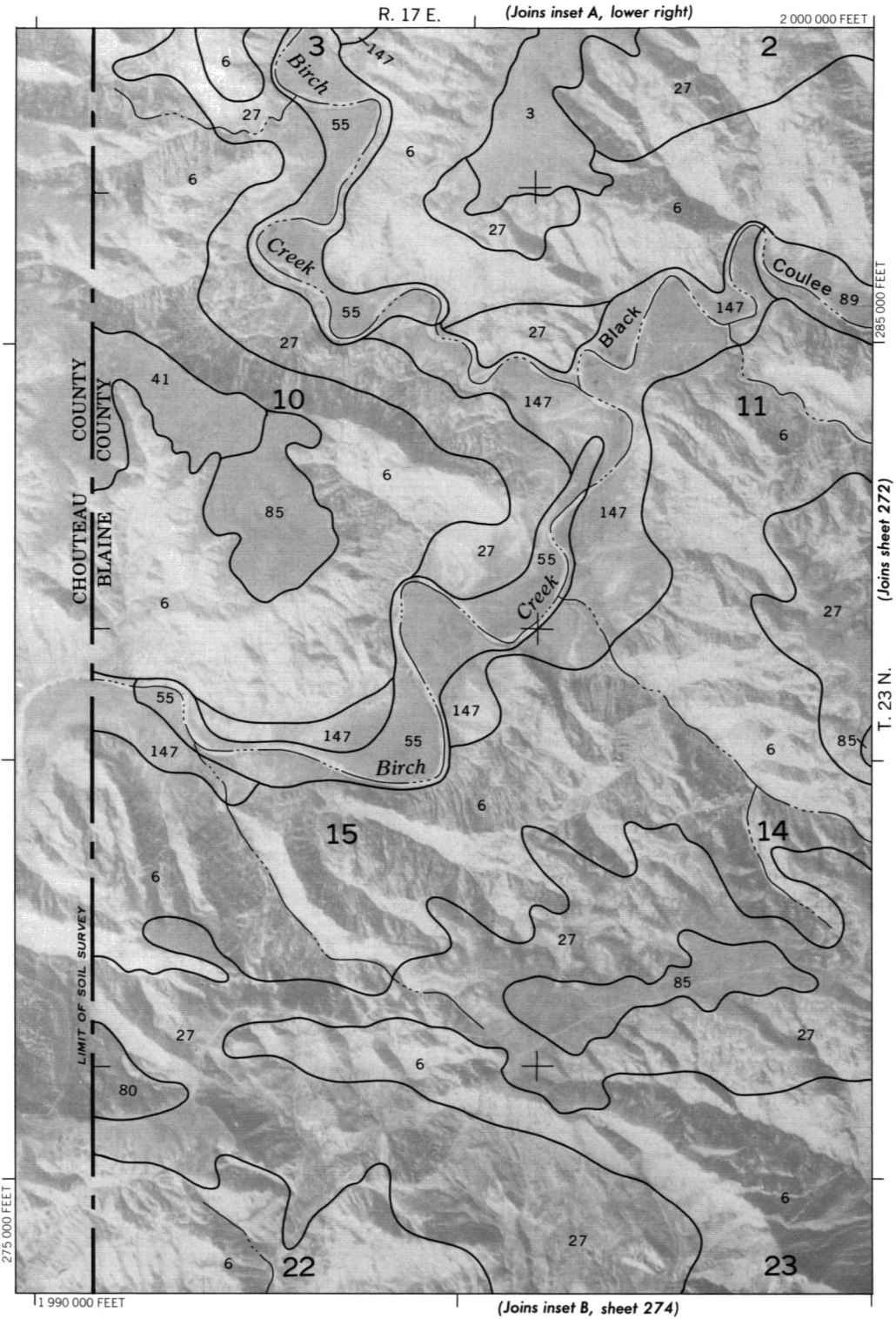




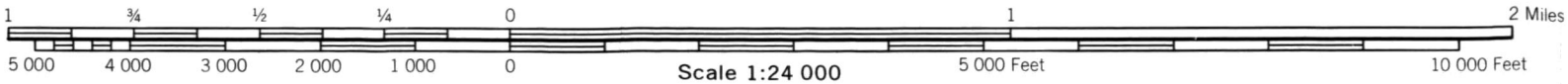
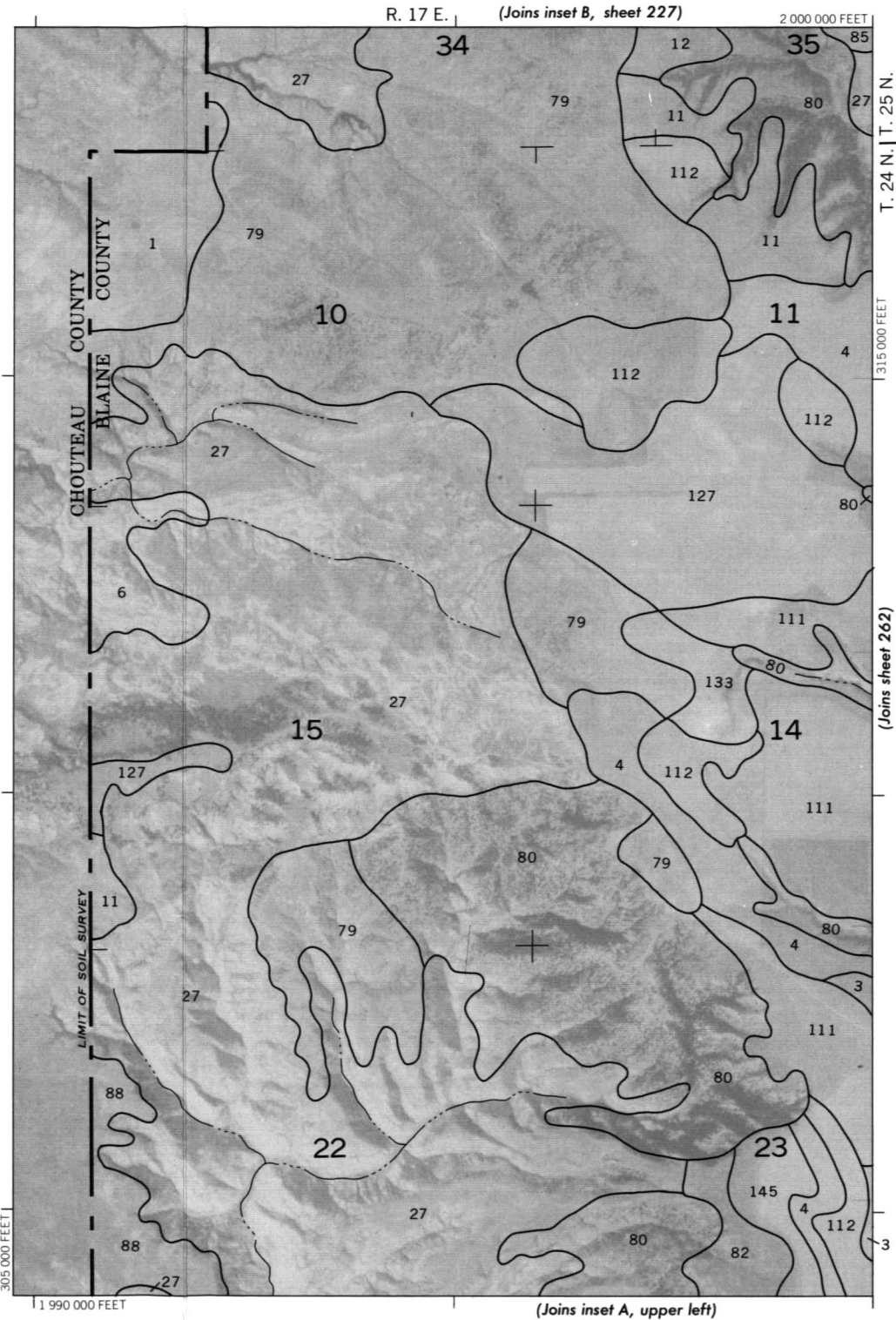
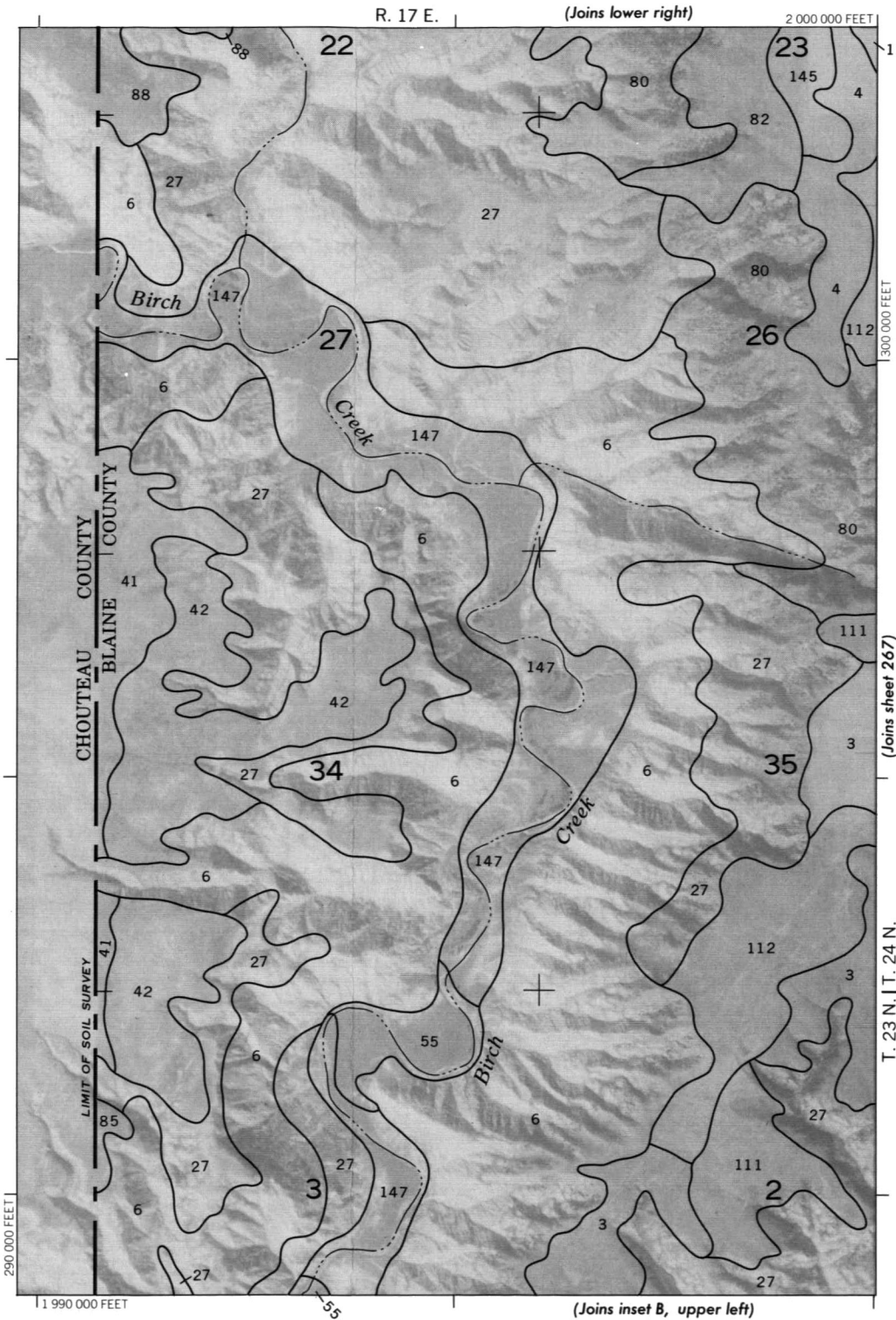
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



INSET B

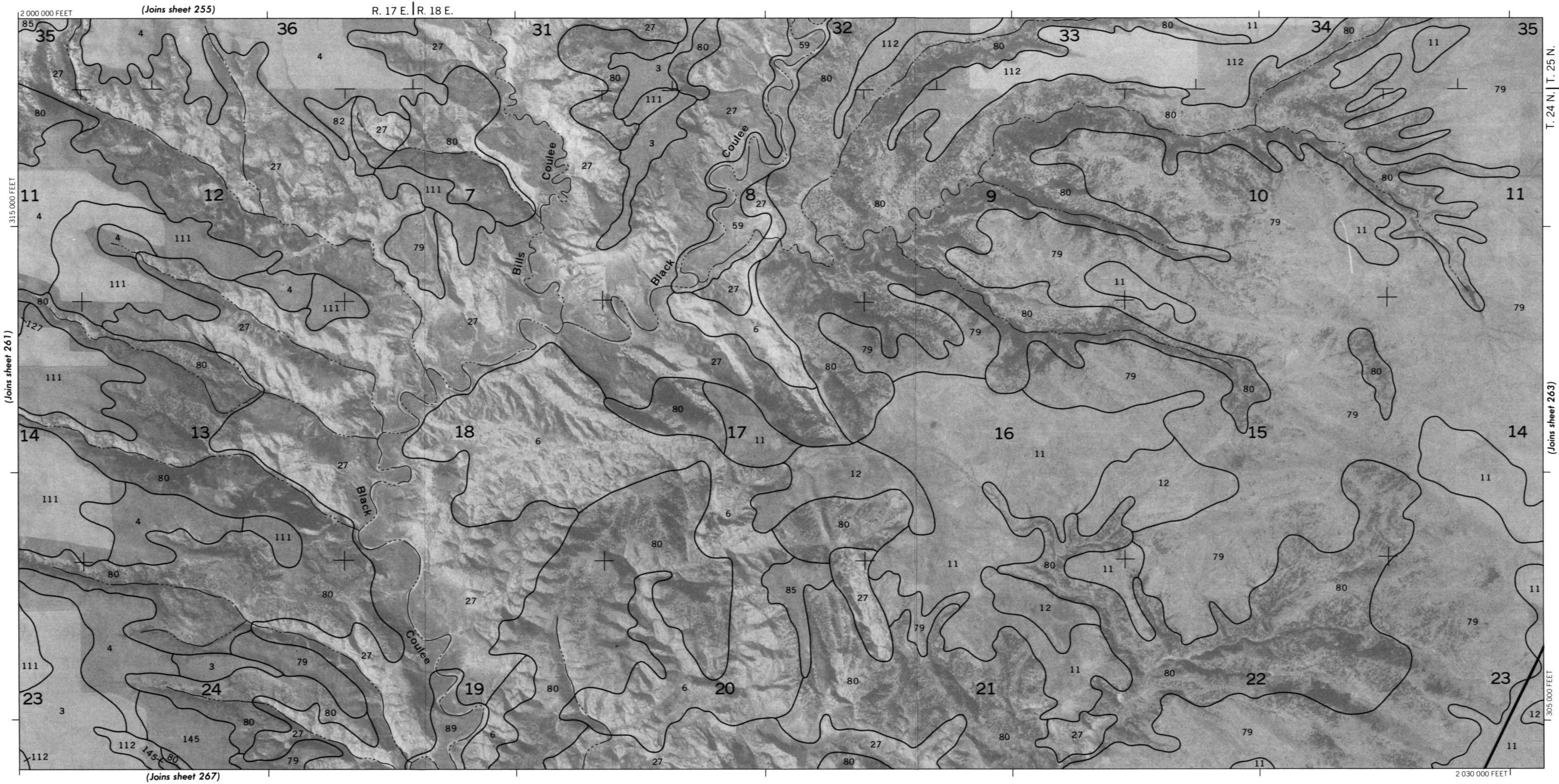


INSET A



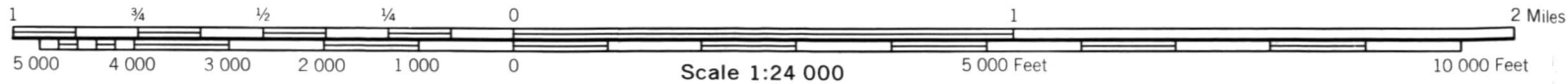
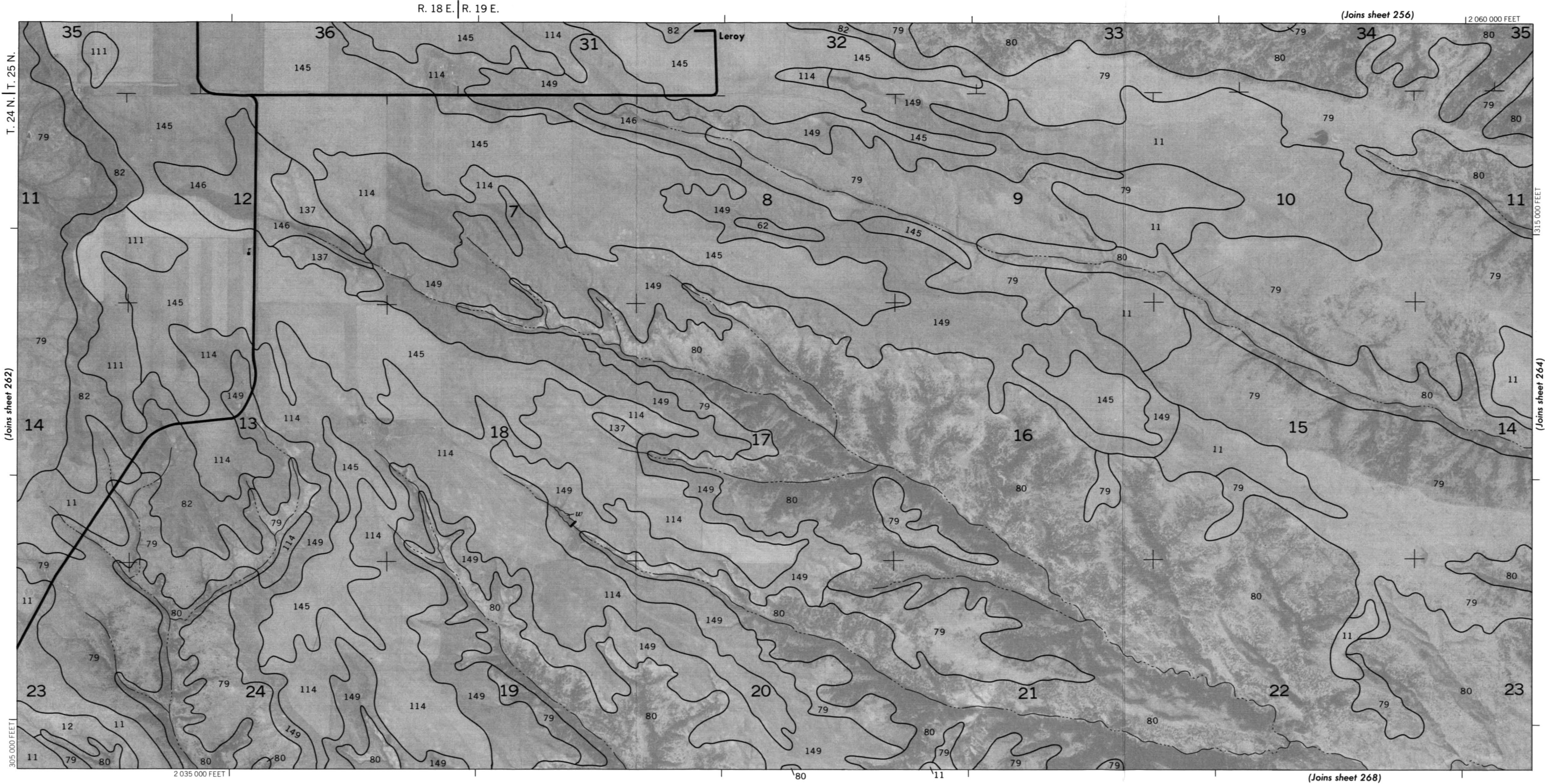


SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 262



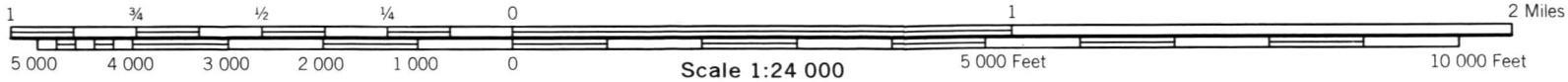
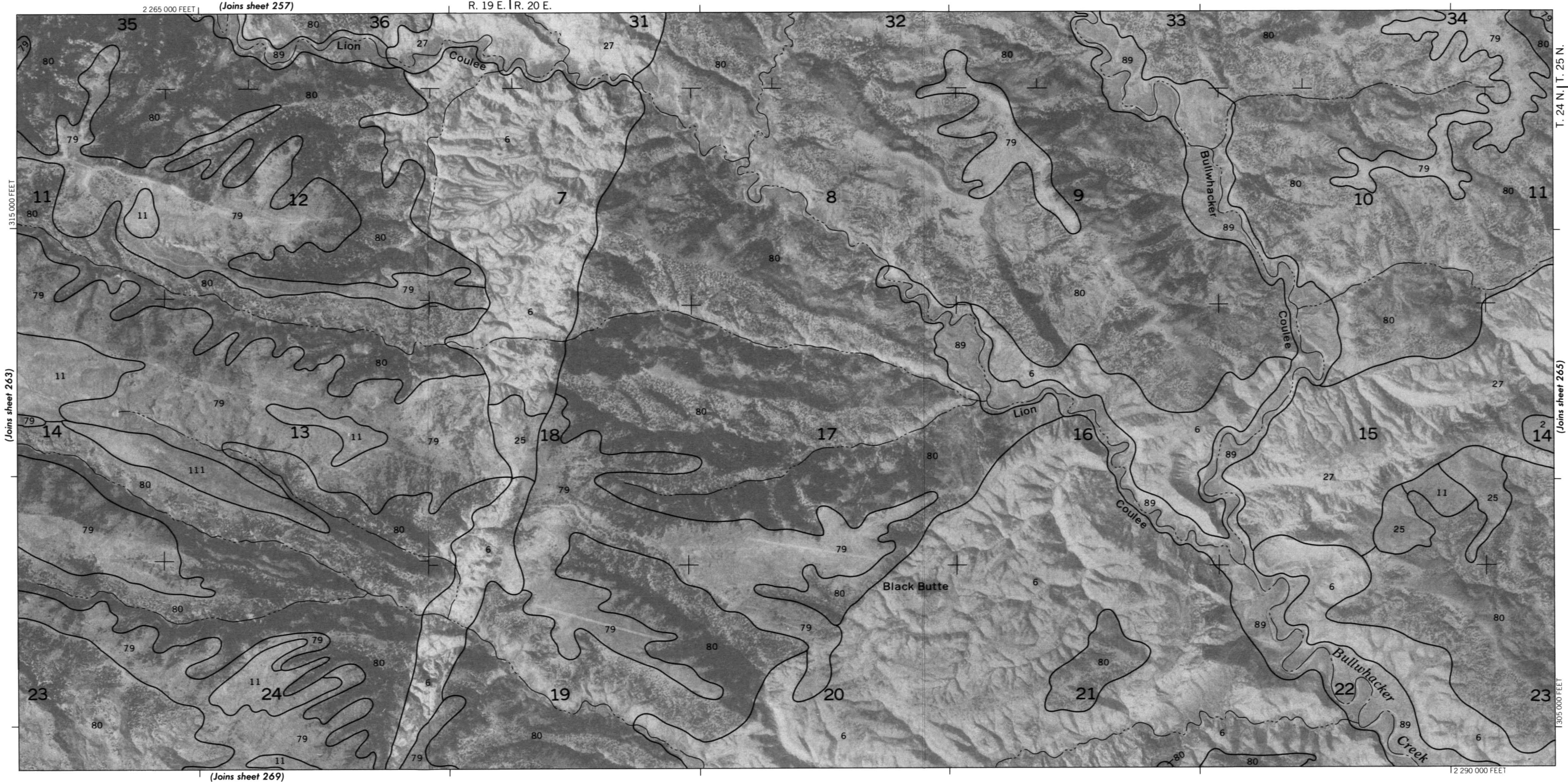
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





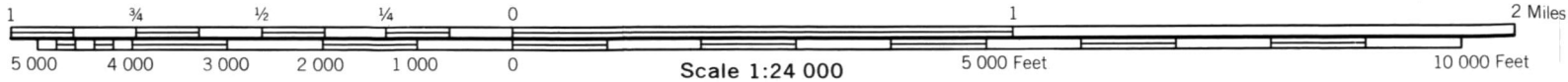
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 264

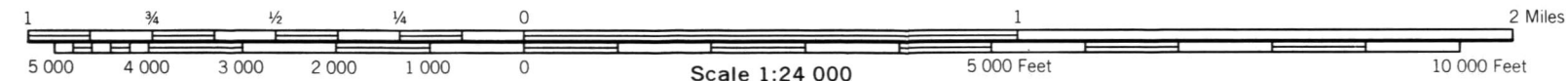
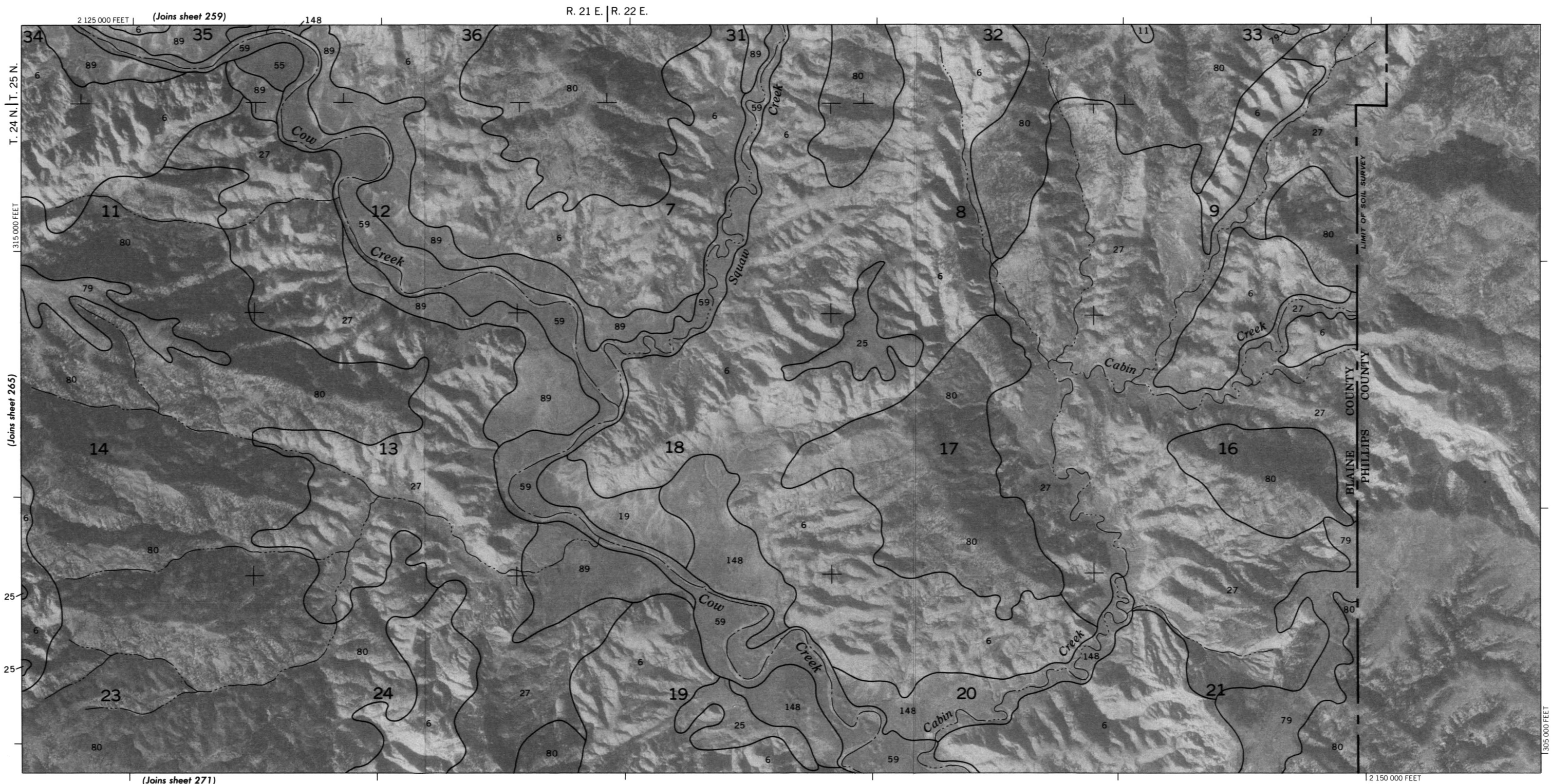


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 265

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

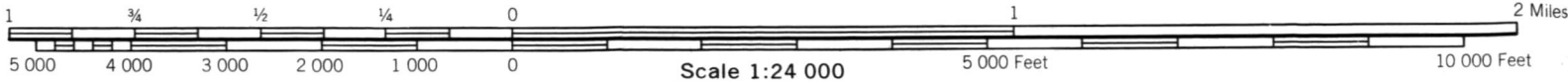




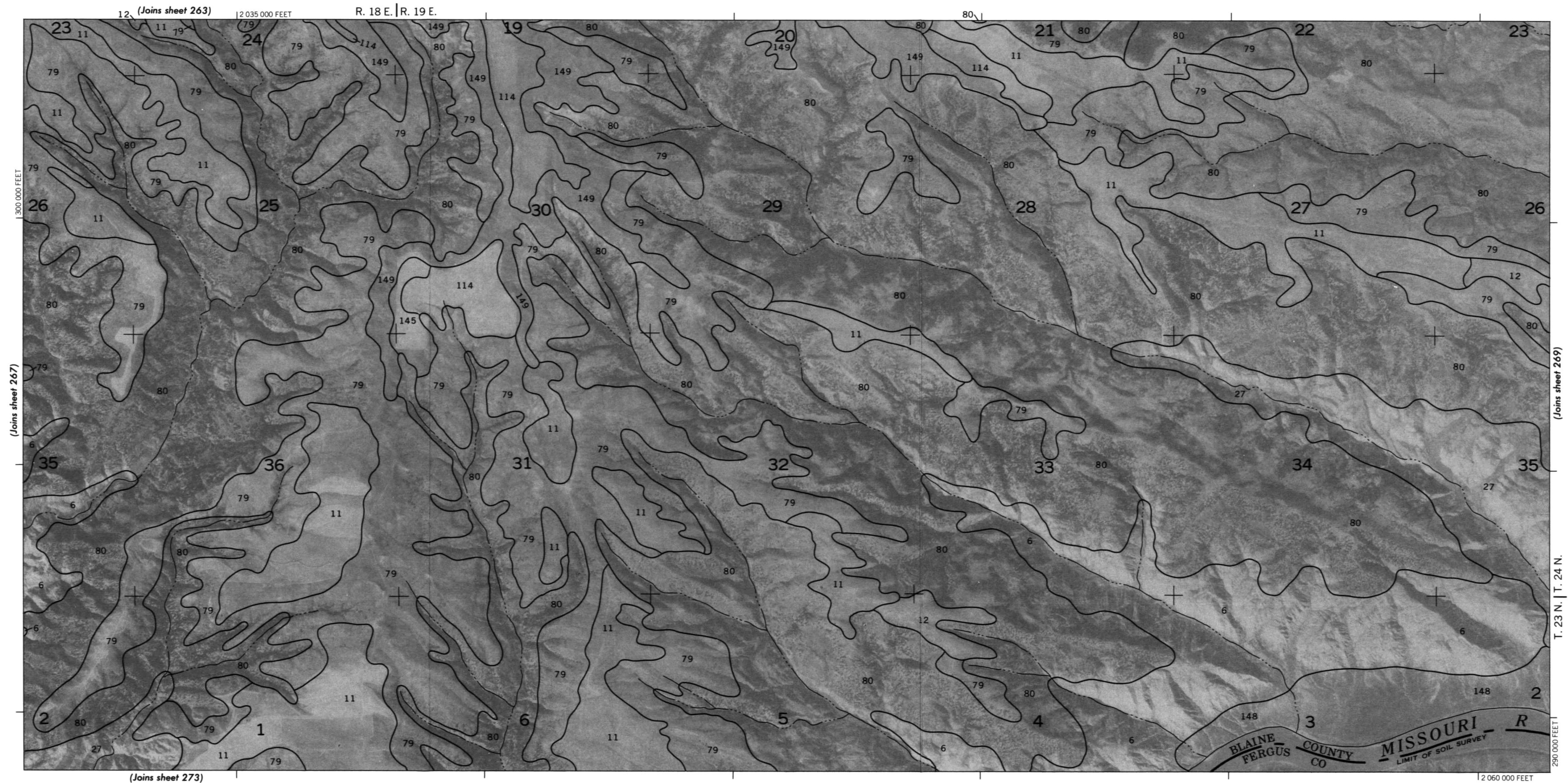
Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 267

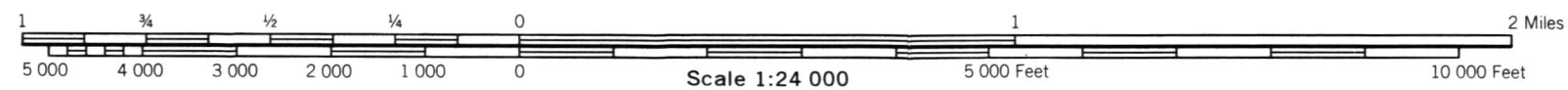


SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 268



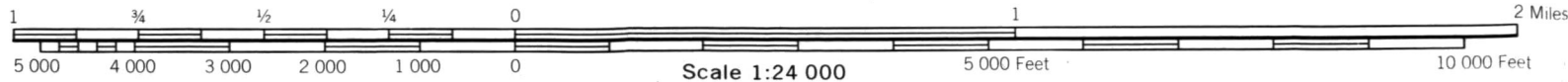
Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 268



BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA NO. 269

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





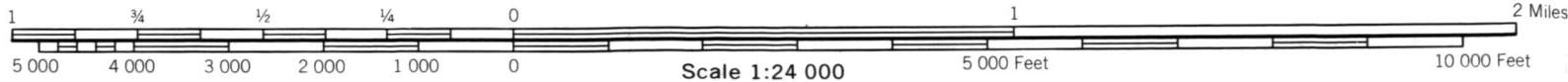
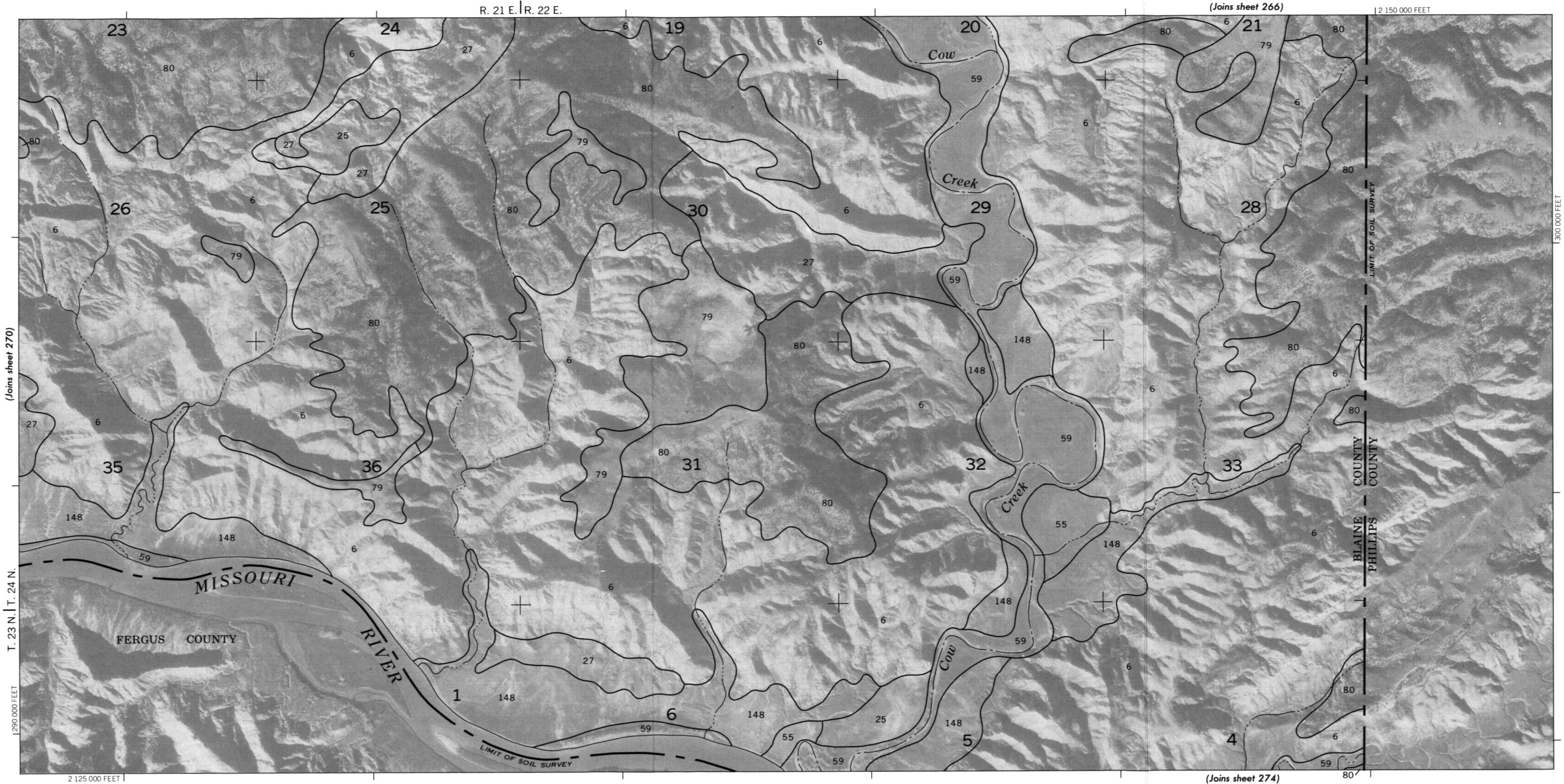
SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 270

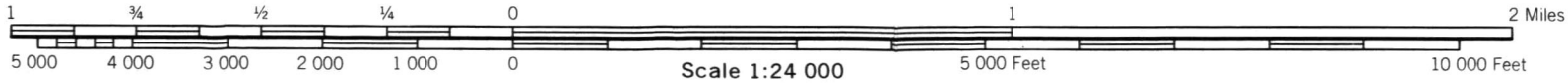
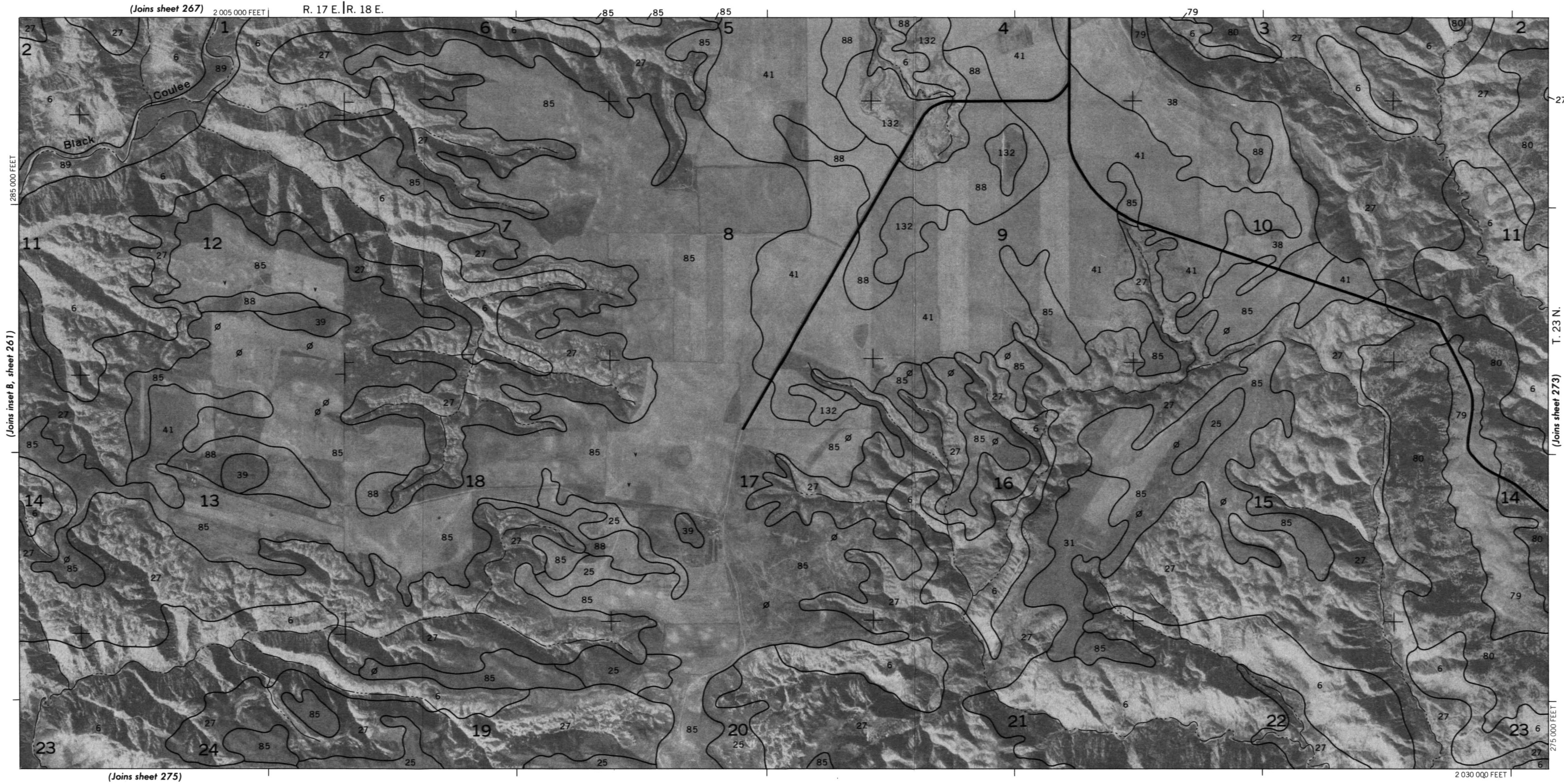


Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

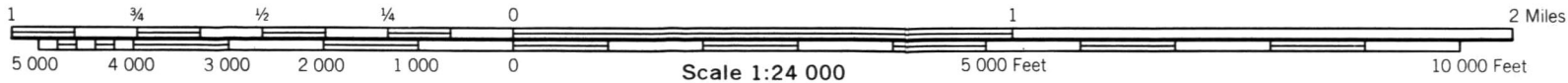
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF BLAINE COUNTY AND PART OF PHILLIPS COUNTY, MONTANA — SHEET NUMBER 271





Coordinate grid ticks and land division corners, if shown, are approximately positioned.
Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography.
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.



Coordinate grid ticks and land division corners, if shown, are approximately positioned. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1975 aerial photography. This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

